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WATERSHED PLAN
and
ENVIRONMENTAL IMPACT STATEMENT

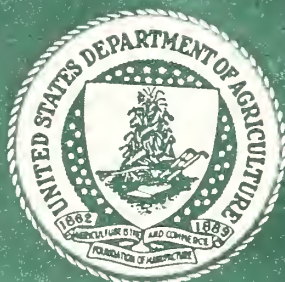
SOUTH FORK WATERSHED
Butler, Chase, and Greenwood Counties, Kansas

OCTOBER 1984

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ADDENDUM

South Fork Watershed
Butler, Chase, and Greenwood Counties, Kansas

The attached tables show annual project costs, benefits, and benefit-cost ratio based on $8 \frac{3}{8}$ interest at projected 1984 prices.

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CATALOGING IN PROGRESS

TABLE 1 - ESTIMATED INSTALLATION COST

South Fork Watershed, Kansas

Installation Cost Item	Unit	Number	Estimated Cost (Dollars) ^{a/}						TOTAL
			P. L. 566			Other			
			SCS ^{b/}	FS ^{b/}	Total	SCS ^{b/}	FS ^{b/}	Total	
<u>LAND TREATMENT - ACCELERATED</u>									
Rangeland Improvement	acres	31,245							31,600
Proper Grazing Use	acres	31,245							79,300
Planned Grazing Systems	acres	2,000							30,500
Brush Control	no.	60							243,700
Ponds	acres	1,200							91,400
Range Seeding									
Wildlife Upland Habitat Management	acres	250							28,400
Forest Management	acres	500						13,700	13,700
Fire Control	acres	162,800						33,000	33,000
Technical Assistance			150,800		150,800				150,800
TOTAL LAND TREATMENT			150,800		150,800	504,900	46,700	551,600	702,400
<u>STRUCTURAL MEASURES</u>									
Floodwater Retarding Dams	no.	11	5,448,800		5,448,800	281,700		281,700	5,730,500
TOTAL PROJECT			5,599,600	- 0 -	5,599,600	786,600	46,700	833,300	6,432,900

a/ Price Base 1984

b/ Federal agency responsible for assistance in installation of works of improvement

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TABLE 2 - ESTIMATED COST DISTRIBUTION
STRUCTURAL MEASURES

South Fork Watershed, Kansas
(Dollars)^{a/}

Item	Installation Cost P.L. 566 Funds				Installation Cost - Other Funds			Total Cost
	Construction	Engineering	Project Admin.	Total P. L. 566	Land Rights	Project Admin.	Total Other	
STRUCTURAL MEASURES								
Floodwater Retarding Dams								
2	274,100	38,400	91,800	404,300	16,000	1,600	17,700	422,000
3	163,100	22,800	54,100	240,000	9,700	1,300	11,100	251,100
6	302,800	42,300	101,500	446,600	20,700	1,600	22,300	468,900
7	359,100	50,300	120,300	529,700	28,500	1,700	30,300	560,000
9	285,000	39,900	95,400	420,300	24,300	1,500	25,800	446,100
10	403,400	56,500	135,400	595,300	27,200 ^{b/}	1,700	28,900	624,200
16	148,200	20,700	49,200	218,100	11,000	1,200	12,200	230,300
20	424,100	59,400	142,300	625,800	28,800	1,900	30,700	656,500
22	333,700	46,700	111,800	492,200	20,500	1,600	22,100	514,300
23A	612,400	85,600	207,900	905,900	43,900	3,100	46,800	952,700
24	386,700	54,100	129,800	570,600	32,000	1,900	33,800	604,400
GRAND TOTAL	3,692,600	516,700	1,239,500	5,448,800	262,600	19,100	281,700	5,730,500

^{a/} Price Base 1984

^{b/} Includes \$600 for road modification

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TABLE 4 - ANNUALIZED ADVERSE NED EFFECTS

South Fork Watershed, Kansas

(Dollars)^{a/}

EVALUATION UNIT	PROJECT OUTLAYS ^{b/}		TOTAL
	Amortization of Installation Cost	Operation and Maintenance Cost	
Floodwater Retarding Dams Nos. 6, 7, 9, 10, 16, 20, 22, 23A, and 24	291,300	10,400	301,700
Floodwater Retarding Dam No. 2	21,800	900	22,700
Floodwater Retarding Dam No. 3	16,500	600	17,100
Accelerated Land Treatment	38,800	26,100	64,900
TOTAL	368,400	38,000	406,400

^{a/} Price Base 1984; all costs discounted to the beginning of the installation period and annualized at 8 3/8 interest rate for the period of analysis

^{b/} See attached Table IV for undiscounted annual costs

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TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE
REDUCTION BENEFITS

South Fork Waterhed, Kansas

(Dollars)^{a/}

Item	Estimated Average Annual Damage		Damage Reduction Benefits Within the Watershed
	Without Project	With Project	Structural Measures
Floodwater			
Crop and Pasture	518,800	222,500	296,300
Other Agricultural	73,700	26,800	46,900
Non-agricultural			
Road and Bridge	9,400	4,700	4,700
Subtotal	601,900	254,000	347,900
Erosion			
Flood Plain Scour	116,800	63,900	52,900
Subtotal	718,700	317,900	400,800

Item	Estimated Average Annual Damage		Damage Reduction Benefits to Cottonwood River Properties Outside the Watershed
	Without Project	With Project	Structural Measures
Floodwater			
Crop and Pasture	2,064,000	1,947,600	116,400
Other Agricultural	102,400	96,300	6,100
Non-agricultural			
Road and Bridge	334,100	315,800	18,300
Railroad	169,900	156,100	13,800
Subtotal	2,670,400	2,515,800	154,600

GRAND TOTAL	3,389,100	2,833,700	555,400
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^{a/} Price Base 1984

October 1984

TABLE 6 - COMPARISON OF NED BENEFITS AND COSTS

South Fork Watershed, Kansas

(Dollars)^{a/}

Evaluation Unit	Damage Reduction Benefits	Intensification Benefits	Flood Damage Reduction Benefits Outside Watershed	Total Benefits <u>c/</u>	Total Costs <u>b/</u>	Benefit Cost Ratio
Floodwater Retarding Dams Nos. 6, 7, 9, 10, 16, 20, 22, 23A, and 24	248,500	32,200	98,100	378,800	301,700	1.3:1
Floodwater Retarding Dam No. 2	16,400	4,000	5,700	26,100	22,700	1.1:1
Floodwater Retarding Dam No. 3	12,700	2,100	3,300	18,100	17,100	1.1:1
Accelerated Land Treatment	-0-	145,700	-0-	145,700	64,900	2.2:1
TOTAL	277,600	184,000	107,100	568,700	406,400	1.4:1

a/ Price Base 1984. All benefits discounted to the beginning of the installation period and annualized at 8 3/8 interest rate for the period of analysis.

b/ From Table 4

c/ See attached Table V for undiscounted annual benefits

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TABLE IV - ANNUALIZED ADVERSE NED EFFECTS

South Fork Watershed, Kansas

(Dollars)^{a/}

EVALUATION UNIT	PROJECT OUTLAYS		TOTAL
	Amortization of Installation Cost	Operation and Maintenance Cost	
Floodwater Retarding Dams Nos. 6, 7, 9, 10, 16, 20, 22, 23A, and 24	424,700	15,100	439,800
Floodwater Retarding Dam No. 2	35,300	1,500	36,800
Floodwater Retarding Dam No. 3	20,100	800	20,900
Accelerated Land Treatment	58,900	39,500	98,400
TOTAL	539,000	56,900	595,900

^{a/} Price Base 1984, discounted and annualized at 8 3/8 interest rate for 100 years.

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TABLE V - COMPARISON OF NED BENEFITS AND COSTS

South Fork Watershed, Kansas

(Dollars)^{a/}

Evaluation Unit	Damage Reduction Benefits	Intensification Benefits	Flood Damage Reduction Benefits Outside Watershed	Total Benefits	Total Costs ^{b/}	Benefit Cost Ratio
Floodwater Retarding Dams Nos. 6, 7, 9, 10, 16, 20, 22, 23A, and 24	358,100	46,400	141,200	545,700	439,800	1.2:1
Floodwater Retarding Dam No. 2	26,600	6,500	9,200	42,300	36,800	1.1:1
Floodwater Retarding Dam No. 3	16,100	2,700	4,200	23,000	20,900	1.1:1
Accelerated Land Treatment	-0-	220,800	-0-	220,800	98,400	2.2:1
TOTAL	400,800	276,400	154,600	831,800	595,900	1.4:1

^{a/} Price Base 1984; annual benefits for 100 years.^{b/} From Table IV

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FINAL
WATERSHED PLAN AND ENVIRONMENTAL IMPACT STATEMENT
SOUTH FORK WATERSHED

Butler, Chase, and Greenwood Counties, Kansas

Abstract: This document describes a plan of small dams to solve agricultural flooding and erosion problems. Land treatment and woodland habitat management measures are also included to reduce erosion and to enhance terrestrial wildlife habitat. Alternatives considered during planning include: no project action, a primarily nonstructural plan, an environmental quality plan, a national economic development plan, and the recommended plan. Economic benefits exceed costs of the proposed plan. Sponsors will pay 13 percent of the installation costs. Environmental impacts include: reduced upland erosion, reduced sedimentation, reduced flooding, decrease of terrestrial habitat, increase of aquatic habitat, and increase in habitat quality.

This document fulfills the requirements of the National Environmental Policy Act and is to be considered for authorization of Public Law 566 funding.

Prepared under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended (16 USC 1001-1008) and in accordance with Section 102(2)(C) of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 USC 4321 et seq).

Prepared by: South Fork Watershed Joint District No. 76; Chase County Conservation District; Butler County Conservation District; Greenwood County Conservation District; Kansas State Conservation Commission; U.S. Department of Agriculture, Soil Conservation Service; U.S. Department of Agriculture, Forest Service; and Kansas Fish and Game Commission.

For additional information, contact: John W. Tippie, State Conservationist, Soil Conservation Service, 760 S. Broadway, Salina, Kansas 67401. Phone: 913-823-4565.

WATERSHED AGREEMENT

between the

South Fork Watershed Joint District No. 76
Chase County Conservation District
Butler County Conservation District
Greenwood County Conservation District

(referred to herein as sponsors)

State of Kansas

and the

Soil Conservation Service
United States Department of Agriculture

(referred to herein as SCS)

Whereas, application has heretofore been made to the Secretary of Agriculture by local organization(s) for assistance in preparing a plan for works of improvement for the South Fork Watershed, State of Kansas, under the authority of the Watershed Protection and Flood Prevention Act (16 U.S.C. 1001-1008); and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Soil Conservation Service (SCS); and

Whereas, there has been developed through the cooperative efforts of local organizations and SCS a plan for works of improvement for South Fork Watershed, State of Kansas, hereinafter referred to as the watershed plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Secretary of Agriculture, through the SCS, and the sponsors hereby agree on this plan and that the works of improvement for this project will be installed, operated, and maintained in accordance with the terms, conditions, and stipulations provided for in this watershed plan and including the following:

1. The sponsors will acquire, with other than Public Law 566 funds, such land rights as will be needed in connection with the works of improvement. (Estimated cost \$258,700)

2. The sponsors assure that comparable replacement dwellings will be available for individuals and persons displaced from dwellings, and will provide relocation assistance advisory services and relocation assistance, make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) effective as of January 2, 1971, and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the sponsors and SCS as follows:

	<u>Sponsors</u> (percent)	<u>SCS</u> (percent)	<u>Estimated Relocation Payment Costs</u> (dollars)
Relocation Payments	13	87	- 0 - <u>a/</u>

a/ Investigation has disclosed that under present conditions the project measures will not result in displacement of any person, business, or farm operation. However, if relocations become necessary, relocation payments will be cost shared in accordance with the percentages shown.

3. The sponsors will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to state law as may be needed in the installation and operation of the works of improvement.

4. The percentages of construction costs to be paid by the sponsors and by SCS are as follows:

<u>Works of Improvement</u>	<u>Sponsors</u> (percent)	<u>SCS</u> (percent)	<u>Estimated Construction Cost</u> (dollars)
11 Floodwater Retarding Dams	0	100	\$3,636,900

5. The percentages of the engineering costs to be borne by the sponsors and SCS are as follows:

<u>Works of Improvement</u>	<u>Sponsors (percent)</u>	<u>SCS (percent)</u>	<u>Estimated Engineering Costs (dollars)</u>
11 Floodwater Retarding Dams	0	100	\$508,900

6. The sponsors and SCS will each bear the costs of project administration which it incurs, estimated to be \$18,700 and \$1,220,800 respectively.

7. The sponsors will obtain agreements from owners of not less than 50 percent of the land above each floodwater retarding dam that they will carry out conservation farm or ranch plans on their land.

8. The sponsors will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed plan.

9. The sponsors will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

10. The sponsors will be responsible for the operation and maintenance of the works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

11. The costs shown in this plan represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

12. This agreement is not a fund obligating document. Financial and other assistance to be furnished by SCS in carrying out the plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.

13. A separate agreement will be entered into between SCS and sponsors before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

14. This plan may be amended or revised only by mutual agreement of the parties hereto except that SCS may deauthorize funding at any time it determines that the sponsor has failed to comply with the conditions of this agreement. In this case, SCS shall promptly notify the sponsor in writing of the determination and the reasons for the deauthorization of project funding, together with the effective date. Payments made to the sponsor or recoveries by SCS shall be in accord with the legal rights and liabilities of the parties when project funding has been deauthorized.

15. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this plan, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

16. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964, as amended, and the regulations of the Secretary of Agriculture (7 CFR 15.1-15.12), which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any activity receiving federal financial assistance.

SOUTH FORK WATERSHED JOINT
DISTRICT NO. 76

Local Organization

By _____

Title _____

Address _____ Zip Code _____

Date _____

The signing of this agreement was authorized by a resolution of
the governing body of the _____
Local Organization

adopted at a meeting held on SOUTH FORK WATERSHED JOINT DISTRICT NO. 76

Secretary, Local Organization

Address _____ Zip Code _____

Date _____

CHASE COUNTY CONSERVATION
DISTRICT

Local Organization

By _____

Title _____

Address _____ Zip Code _____

Date _____

The signing of this agreement was authorized by a resolution of
the governing body of the CHASE COUNTY CONSERVATION DISTRICT
Local Organization

adopted at a meeting held on _____

Secretary, Local Organization

Address _____ Zip Code _____

Date _____

BUTLER COUNTY CONSERVATION
DISTRICT

Local Organization

By _____

Title _____

Address Zip Code

Date _____

The signing of this agreement was authorized by a resolution of
the governing body of the BUTLER COUNTY CONSERVATION DISTRICT
Local Organization

adopted at a meeting held on _____

Secretary, Local Organization

Address Zip Code

Date _____

GREENWOOD COUNTY CONSERVATION
DISTRICT

Local Organization

By _____

Title _____

Address Zip Code

Date _____

The signing of this agreement was authorized by a resolution of
the governing body of the GREENWOOD COUNTY CONSERVATION DISTRICT
Local Organization

adopted at a meeting held on _____

Secretary, Local Organization

Address Zip Code

Date _____

Soil Conservation Service
United States Department of Agriculture

Approved by:

John W. Tippie
State Conservationist

Date

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Summary of Watershed Plan/Environmental Impact Statement

Project Name: South Fork Watershed

Counties: Butler, Chase, and Greenwood

State: Kansas

Sponsors: South Fork Watershed Joint District No. 76

Butler County Conservation District

Chase County Conservation District

Greenwood County Conservation District

Description of Recommended Plan: The Recommended Plan will consist of 11 P.L. 566 floodwater retarding dams to be installed over a 10-year period. It will include a range improvement program to bring 90 percent of the native rangeland to good or better condition. It will include restricted grazing of bottomland woodlands to improve their value for wildlife.

Alternatives Considered: Alternative 1 (No Project) consists of continuing the present conservation program. Alternative 2 National Economic Development (NED) Plan includes 11 floodwater retarding dams and accelerated land treatment (wildlife habitat improvement on rangeland and bottomland woodlands). Alternative 3 Environmental Quality (EQ) Plan consists of wildlife habitat improvement on rangeland and bottomland woodlands. Alternative 4, a primarily nonstructural plan to reduce agricultural flooding, would not produce benefits in excess of costs. Alternative 5, the Recommended Plan, is the same as Alternative 2, the National Economic Development Plan.

Resource Information:

Size of Watershed (acres) - 184,550

Land Use (acres) - Cropland	16,773
Pastureland	2,797
Native Pasture	2,950
Rangeland	157,482
Wildlife Land	556
Woodland	1,569
Transportation	
Services	860
Farmstead and	
Residential Land	1,043
Other (water)	520

Land Ownership - Private	99.7%
State-Local	0.3%
Federal	0

Number of Farms - 128; Average size about 1,350 acres
Prime Farmland - 32,113 acres.

Wetland (acres by type) - Type 5 - 280 acres
Type 1, 2, 3, 4, and 6 -
minor amounts

Flood Plain (acres by land use) - Evaluated Flood Plain

Cropland	7,214
Pastureland	219
Woodland	656
Other Land	356
Total	8,445

State Listed Topeka shiner (Notropis topeka),
Threatened or found at 5 of the proposed dam sites,
Endangered Species: mitigation for habitat losses required.

Neosho madtom (Noturus placidus), found
outside the watershed at confluence of
South Fork with Cottonwood River on
gravel bar; not affected by the watershed.

Warty-backed mussel (Quadrula nodulata):
an Emporia State University report
said it was found in the watershed
in 1979, but not in their investigation.

Cultural Resources: Wood House in Chase County, listed in the
National Register of Historic Places.

Crocker Ranch, 1 1/2 miles north of
Matfield Green on K-177, listed in the
National Register of Historic Places.

Seven archeological sites in the area
of Dam No. 23A considered eligible for
listing in the National Register of
Historic Places.

Problem Identification: Major economic problems are caused
by flooding and scour erosion. Agricultural flooding and
scour erosion reduce crop yields, increase costs, and reduce
farm income. Flood damage to crops and pasture and scour
erosion damage average \$601,400 annually within the project.
Floodwater from South Fork Watershed also causes significant
damage on the mainstem Cottonwood River valley. Poor and
fair condition rangeland limits wildlife numbers and income
from range.

Candidate Plans Considered:

Alternative 2, the NED plan, would produce the greatest increase in agricultural income due to flood control. This alternative would also improve wildlife habitat and increase agricultural income by improving rangeland for livestock.

Alternative 3, the EQ plan, would improve wildlife habitat and would increase agricultural income by improving rangeland for livestock. The EQ plan would not provide flood control.

Alternative 5, the Recommended Plan, offers the highest flood control, improves wildlife habitat, and provides the opportunity for farmers to increase their income.

Project Purpose: This project is for watershed protection and flood prevention to reduce erosion and floodwater damages so that agricultural income and the quality of wildlife habitat can be increased.

Principal Project Measures: 11 floodwater retarding dams
range improvement on 31,245 acres
fire control on 162,800 acres
forestland management on 500 acres
wildlife upland habitat management on 250 acres

Project Costs:

	<u>P.L. 566 Funds</u>		<u>Other Funds</u>		<u>Total Dollars</u>
	\$	%	\$	%	\$
Land Treatment Measures					
Range Improvement	0	0	469,300	100	469,300
Forestland Management	0	0	13,500	100	13,500
Fire Control	0	0	32,500	100	32,500
Wildlife Upland					
Habitat Management	0	0	28,000	100	28,000
Technical Assistance	148,500	100	0	0	148,500
Structural Measures for					
Flood Prevention	4,145,800	94	258,700	6	4,404,500
Project Administration	1,220,800	98	18,700	2	1,239,500

a/ Includes funds for harvesting and replanting

<u>Project Benefits:</u>	\$	Other
Flood protection benefits		
On project	379,700	55.8% reduction
Off project	147,000	5.8% reduction
More intensive use benefits	52,100	Increased income
Range intensification benefits	203,700	Increased income
Area Benefitted - Flood plain 8,445 acres		
Rangeland 31,245 acres		
Wildlife habitat 31,495 acres		
Forest management 500 acres		
Fire control (rangeland) 162,800 acres		

Impacts:

Land Use Changes:

<u>Land Use</u>	<u>Future Without Project (acres)</u>	<u>Future With Project (acres)</u>	<u>Impact</u>
Cropland	16,773	16,671	- 102
Pastureland	2,797	2,797	-
Native Pasture	2,950	2,700	- 250
Rangeland	157,282 <u>a/</u>	156,955	- 327
Wildlife Land	556	893	+ 337
Woodland	1,569	1,569	-
Transportation Services	860	860	-
Farmstead and Residential	1,043	1,043	-
Other (water)	720 <u>a/</u>	1,062	+ 342

a/ 200 acres from present rangeland to future water to account for detention dams (state terminology) to be built in future without project

Natural Resources Changed or Lost:

Wildlife Habitat (HU*)	
Cropland -	306 HU lost
Grassland -	135,807 HU gained
Forestland -	750 HU gained

*HU represents Habitat Units, a rated quality value (from 1 to 10) multiplied by acres

Fisheries (HU*)

Aquatic (stream) habitat - 116 HU lost
Aquatic (lake) habitat - 2,189 HU gained

Prime Farmland (acres) -

Flood plain gained = 1,432 acres
Upland lost to structures = 230 acres
Net gain of 1,202 acres

Other Impacts: The project will have a major impact on agricultural flooding and, thereby, on crop production and income. It will have a moderate impact on erosion, which also affects yield and income.

Major Conclusions: The recommended plan for flood prevention and watershed protection consists of 11 P.L. 566 floodwater retarding dams to be installed over a 10-year period. The plan also includes a range improvement program to bring 90 percent of the native rangeland to a good or better condition and management of riparian woodlands and rangeland to improve their value for wildlife.

Areas of Controversy: None

Issues to be Resolved: None

INTRODUCTION

The watershed plan and environmental impact statement have been combined into a single document describing plan formulation, expected economic and environmental impacts, and the basis for authorizing federal assistance for implementation.

The sponsoring local organizations are:

South Fork Watershed Joint District No. 76
Chase County Conservation District
Butler County Conservation District
Greenwood County Conservation District

The Soil Conservation Service, Forest Service, Kansas State Conservation Commission, and Kansas Fish and Game Commission assisted the local sponsors in developing the plan. Financial and technical assistance was provided by the Kansas State Conservation Commission. Other federal, state and local agencies also assisted by providing information, reviewing data, and helping with assessments. South Fork Watershed was planned together with three other watersheds in the Cottonwood River basin--Middle Creek Watershed, Diamond Creek Watershed, and Peyton Creek Watershed.

The Soil Conservation Service is responsible for compliance with the National Environmental Policy Act (NEPA).

PROJECT SETTING

South Fork Watershed is comprised of 184,550 acres (288 square miles) in the Flint Hills of central Kansas. The watershed is in the Arkansas-Red-White River Basin designated by Water Resources hydrologic unit code 11070203-060. The drainage area includes 161,241 acres in Chase County, 8,960 acres in Butler County, and 14,349 acres in Greenwood County (see Project Map, Appendix D). The main stem of the South Fork of the Cottonwood River originates 4 miles south of the Chase County line along the Butler and Greenwood County boundaries. The main stem drains north and enters the Cottonwood River 3 1/2 miles east of Cottonwood Falls. (see Cottonwood River Basin Map, Appendix D.) Bloody Creek is an independent tributary to the Cottonwood River located to the east of the South Fork. Buck Creek and Spring Creek are also independent tributaries to the west. These independent tributaries are included in the Watershed Plan. South Fork Watershed is in the Kansas-Oklahoma Bluestem Region of the natural agricultural resource areas of Kansas. The rolling

bluestem grassland of the Flint Hills with its numerous limestone outcrops and wooded, clear-flowing streams is uniquely beautiful throughout the year.

Population of the watershed is estimated at 1,800. There are no minorities in the watershed. Cottonwood Falls, population 1,025, is located in the north part of the watershed on the Cottonwood River. The unincorporated town of Bazaar is located in the middle of the watershed, and Matfield Green, population 70, is in the south-central part. Emporia, population 26,174, is about 20 miles northeast of the watershed on the Cottonwood River. 6/ 27/ 36/ 37/*

Economy of the area is based on raising and feeding livestock. Land use is 85 percent rangeland and 9 percent cropland (see Table C on page 14 for complete land use data). The average size operating unit in the watershed is 1,350 acres.28/ Most of the 128 farms in the watershed produce primarily livestock feed.

The native prairie grasses of the Flint Hills provide stable, economic grazing for livestock. Native grass pastures are tall and mid, warm season grasses: big bluestem, little bluestem, indiangrass, switchgrass, sideoats grama, blue grama, and others.

Most of the soils of the area are very dark to nearly black, highly granular, silt loam or silty clay loams with chert or flint fragments throughout. The soils are formed from the weathering of limestone, shale, and cherty limestone and are readily permeable with enough clay and silt mixed with rock fragments to furnish good water storage capacity. Soils on the flood plain are of the Reading-Tully series in Chase County and the Reading series in Greenwood County. The upland soils of South Fork Watershed are primarily the Clime-Sogn and the Florence-Labette association. 25/ 11/

Annual precipitation averages about 34 inches.1/ 2/ 4/ Cottonwood Falls reported 57 inches in 1951. In 1936, the driest year on record, Chase County reported 18 inches. Seventy-eight percent of the area's floods occur between April and October during the 179-day average growing season.18/ Approximately 5 percent of the watershed is in the 100-year flood plain. The flood plain includes 7,214 acres of cropland (78 percent).

*Numbers appearing in the text correspond to the numbers of the references.

PROBLEM AND OPPORTUNITY IDENTIFICATION

Agricultural income is reduced because of flooding in South Fork Watershed. Scour erosion of flood plain land also reduces potential income. Wildlife habitat improvement opportunities exist in the watershed.

Flooding Related Problems

The South Fork Watershed by its physical nature is subject to dramatic flooding. The channel of the South Fork is well incised. The flood plain valley fits the V-shaped category. Out-of-bank flows occur once or twice a year. These characteristics produce floods of fast, high rising waters with velocities causing high crop damage and extensive scour damage for the depth of flooding experienced.

Sharps Creek and Rock Creek join South Fork near Bazaar in the lower part of the watershed. These two tributaries together produce a flood peak nearly equal to the flood peak from the upper area of the South Fork. Runoff from these tributaries combine to flood the main stem of the South Fork from relatively small rains in the lower part of the watershed as well as from rains farther upstream. During a widespread rain the waters from these tributaries reach a peak, then the upstream waters reach a second peak, causing "double peak" flooding. The Cottonwood River also experiences a longer duration of flooding because of these double peaks from South Fork.

Although only 5 percent of the watershed is subject to flooding, the flood plain contains 43 percent of the watershed's cropland. For the same amount of rainfall, flood water in a narrow valley such as South Fork is much deeper and swifter than in a wide flood plain.

Growing crops and forage grasses are knocked over and/or covered with sediment, washed away, and rendered poor in quality and yield. Flooding also causes losses by hampering planting and harvesting. Floods that occur before or shortly after crops have been planted cause extra tillage and reseeding operations. Over 50 percent of the farmers interviewed said their average yields would increase 25 to 30 percent if flooding were not a problem.^{33/} Damage is substantially affected by both depth and duration of flooding because of the swift waters. Crop and pasture damages average \$491,900 annually in the watershed and \$1,957,000 on the Cottonwood River due to South Fork and its tributaries flooding. See Appendix C (Table III).

The physical characteristics of the watershed make it nearly impossible for flood plain farmers to protect all buildings, fences, and machinery from flood damage. Although most of the buildings and machinery are on higher ground, the larger storms usually cause considerable damage. There is a large expense for cleaning up debris after each flood. 23/ These other agricultural damages average \$70,300 annually in the watershed and \$97,700 off-project.

Roads on the flood plain are difficult to maintain and bridges are built higher than adjoining roads because of the damaging floodwaters. Seventeen bridges and 4.7 miles of dirt, gravel, and asphalt road surface are subject to flood damages. Floods destroy bridges, wash away road surfacing, scour road shoulders, and fill road ditches with mud. In 1965, "floodwaters from South Fork actually knocked out the stone arch bridge on the Cottonwood River 4 miles east of Cottonwood Falls." 20/ Average annual flood damage to roads and bridges totals \$9,000 in the watershed and \$321,400 on the Cottonwood flood plain.

South Fork Watershed accounts for 17.6 percent of the drainage area in the Cottonwood River Basin. A large storm centered over South Fork can cause major flooding on the Cottonwood River below the confluence. A typical large storm occurred on June 7, 1979.40/ Storm discharges from South Fork can increase a flood peak or the duration of flooding in the lower portion of the Cottonwood River when storms move across the basin from west to east (see Cottonwood River Basin Map, Appendix D). South Fork contributes up to 30 percent of the damage on the Cottonwood River from the confluence to the outlet of the basin. One severe storm occurred on June 5, 1965. If this storm occurred now, flood damages would be about \$1,786,500 in South Fork and \$6,093,000 on the Cottonwood River based on WRC October 1982 current normalized prices and 1982 prices for other items.

Farmers are losing potential income each year because of the flood problem. The farmers along the flood plain reported they could increase their income by increasing their yields an average of 18 percent without the hazard of flooding. Farm inputs such as fertilizer and seed would be increased. More timely field operations would also be made without flooding. Acres remaining in the flood plain would not be farmed more intensively.

Erosion Related Problems

South Fork Watershed has a moderate scour problem because the narrow and deep channel conveys water at a high

velocity. Out-of-bank flooding occurs once or twice a year. Once the floodwater goes out-of-bank, high velocity water due to the steep flood plain gradient scours the fields, removes the topsoil, and exposes the clay subsoils. The yield potential of the flood plain is thereby reduced. Most of the cropland is on the flood plain in the lower part of the watershed, so it is subject to scouring with every flood.

Land and crop damages occur with every flood according to the swiftness of the water and the condition of the fields at the time of the flood. When floods occur after fields are freshly plowed, the soil is removed to the plowed depth. On the other hand, if flooding occurs after wheat or alfalfa has grown high enough (12 inches or more) to produce a good ground cover, scour damage may be slight but sediment accumulation may occur, partially or completely covering the crop. This is damage to growing crops and pasture with no significant damage to the resource base.

Because there is little upland cropland, upland erosion is not a major problem. Over half of the upland cropland is adequately protected from erosion. Remaining cropland can be protected by the ongoing conservation program. Range management is one of the most important conservation practices in this watershed because of the high proportion of grassland. Active gullies on some of the rangeland indicates the need for improved range management. The active gullies are on fairly steep slopes and primarily follow fence lines, roadways and other man-made disturbances in the area.

Most farmers interviewed said they plant alfalfa, brome, and wheat on ground that floods every year, and are using that cropping pattern to reduce soil loss. Soybeans are seldom planted in frequently flooded areas because the soil becomes too loose and is easily washed away.

Fish and Wildlife Habitat Problems and Opportunities

The overall environmental quality of South Fork Watershed is good. It is located in the Flint Hills which are predominantly native rangelands used for grazing cattle. About 85 percent of the watershed is rangeland which is 70 percent adequately protected from erosion. Rangeland wildlife includes: prairie chickens, hawks, coyotes, and deer along with numerous species of birds, mammals, reptiles, and amphibians which are native to the area. The Flint Hills region contains unique aquatic stream habitat for species native to intermittent and spring-fed streams typical of tall grass prairie areas. Aquatic fauna are composed of

species whose life history is dependent upon fluctuating water conditions.

Forty percent of the rangeland in the project area, in poor or fair condition, is not providing optimum habitat for rangeland wildlife. Overgrazing decreases nesting and winter habitat and can ultimately decrease population numbers. Rangelands adjacent to woodlands tend to be the most severely overgrazed, thus reducing the benefits of that edge type habitat. Sixty-two thousand seven hundred fifty acres of rangeland in the watershed needs improvement, including brush control, range seeding, and pond installation to help achieve proper grazing use. This rangeland improvement of 62,750 acres could increase wildlife habitat by 272,960 habitat units.

Less than two percent of the watershed is in streams and ponds. The streams contain some high quality, unique aquatic habitat found only in the Flint Hills region. About 2.7 percent of the watershed is in forestland and 1 percent is miscellaneous land. Forestlands are grazed in many of the upper reaches of the watershed and value for wildlife use is relatively low. Where cropland is the adjoining land use, the forestlands are usually not grazed and provide better quality habitat.

The remaining 9 percent of the watershed is cropland. Control of erosion and sedimentation, good residue management and contour farming would benefit fish and wildlife.

Other Problems and Opportunities

Wildfires destroy wildlife habitat, crops and timber, as well as buildings. Wildlife habitat losses are only temporary, but other losses can be more significant. State fire protection goals are 0.1 percent loss per year for woodlands and 0.5 percent loss per year for grasslands. The Forestry Work Plan prepared for South Fork Watershed by the State and Extension Forester shows that more intensive fire protection is needed on 162,800 acres. The Forestry Work Plan also recognizes the potential to increase income through prescribed timber harvest on 300 acres of forestland.^{12/}

Forty percent of the rangeland is presently in poor or fair condition. Rangeland would be more productive by managing these acres to a good condition. The land treatment measures needed to accomplish this includes brush management, range seeding, and pond installation to help achieve proper grazing use.

Lack of water in dry years is another watershed problem. During the period of 1952 to 1957 many farmers hauled water for both domestic and livestock use; in dry years livestock water for the feedlots is a problem.

Pollution of streams is not a pressing problem in the watershed. However, the potential for becoming a problem does exist if the number of winter feeding operations next to the stream channels increases.38/

INVENTORY AND ANALYSIS OF RESOURCES

Significant Concerns

A wide range of environmental, social, and economic factors were considered during planning as described in the Consultation and Public Participation section of this plan/EIS. The significance of these factors to decision-making is shown in Table A (page 13). Alternatives would have no impact on drainage, mineral resources, stream classification, minority populations, water supply, federally listed threatened and endangered species and relocations; and would have a minor impact on ground water, irrigation, water quality, air quality, visual or cultural resources, recreation, and disease vectors. These factors will not be discussed although some basic data was collected in order to determine the magnitude of impacts. Significant factors were used to compare alternatives and to present the impacts of the selected plan.

Existing Resources

Land cover is classified by the type of vegetation on an area. Present land cover is shown in Table B.

Table B - Present Land Cover

Land Cover	Total Watershed	
	Percent	Acres
Cropland	9.1	16,773
Grassland	86.2	159,113
Forestland	2.7	4,909
Water	1.0	1,852
Urban or Built-up	1.0	1,903
Total	100.0	184,550

Land use is classified by the current primary use of a land unit. Table C is a detailed listing of present land use.

Table A - Resources and Problems Significant to Decisionmaking

Natural Resources and Problems	Degree of Impact <u>a/</u>	Significance to Decision-making <u>b/</u>	Remarks
Flooding	Major	High	Reduces agricultural income
Drainage	None	None	
Erosion	Moderate	High	Reduces flood plain productivity
Sedimentation	Moderate	Low	Low sediment-producing area
Land Use	Moderate	Medium	
Prime Farmland	Moderate	Medium	
Mineral Resources	None	Low	
Stream Classification	None	Low	
Streamflow	Major	Medium	Expect most impact on high flows
Water Supply	None	Low	Shortage of M&I water
Ground Water	Minor	Low	Insufficient for M&I
Irrigation	Minor	None	
Water Quality	Minor	Low	
Air Quality	Minor	Low	
Fish	Moderate	Medium	
Wildlife	Moderate	Medium	Lacks habitat diversity
Federally-listed Endangered, Threatened Species	None	Low	None in watershed
State-listed Endangered, Threatened Species	Moderate	High	Topeka shiner, Neosho madtom, and Warty-backed mussel present
Visual Resources	Minor	Low	
Cultural Resources of National Significance	Moderate	Medium	Wood House, Crocker Ranch 7 archeological sites
Minority Populations	None	Low	
Recreation	Minor	Low	
Transportation	Moderate	Low	
Agricultural Income	Major	High	11% of watershed population is below low-income level
Relocations	None	Low	None expected
Fire Protection	Moderate	Low	
Disease Vectors	Minor	Low	Large open ponds in rural area

a/ Relative magnitude of impact of alternatives
Major - Significant
Moderate - Readily apparent and somewhat significant
Minor - Detectable, but slight
None - At a low level of detection, if at all

b/ Relative magnitude of decisionmaking significance
High - Must be considered in the analysis of alternatives
Medium - May be affected by some alternative solutions
Low - Consider, but not too significant
None - Need not be considered in analysis

Table C - Present Land Use

Land Use	Total Watershed	
	Percent	Acres
Cropland	9.1	16,773
Native Pasture	1.6	2,950
Pastureland	1.5	2,797
Rangeland	85.3	157,482
Wildlife Land	0.3	556
Woodland	0.8	1,569
Transportation Services	0.5	860
Farmstead and Residential Land	0.6	1,043
Other Land (water)	0.3	520
Total	100.0	184,550

The evaluated flood plain is all major stream valley area below structures in which flood damage occurs. All land below the 100-year frequency flood elevation except stream channels is included for determining economic losses and benefits. The project map in Appendix D shows the evaluated flood plain area as area benefited. Table D shows the evaluated flood plain land use and Table E shows the current and projected yields used in the economic analyses.

Table D - Present Evaluated Flood Plain Land Use

Crop	Acres	Percent
Wheat	2,886	34.0
Corn Grain	720	9.0
Sorghum Grain	1,030	12.0
Soybeans	1,803	21.0
Alfalfa	775	9.0
Pastureland	219	3.0
Woodland	656	8.0
Other Land	356	4.0
Total	8,445	100.0

Table E - Current and Projected Yields

Crop	Unit	1981 Average With Flooding	1981 Average Without Flooding	2007 Average Without Flooding
Wheat	bu/ac	35.1	45.9	60.0
Corn Grain	bu/ac	70.2	91.9	120.0
Sorghum Silage	T/ac	15.8	20.7	27.0
Grain Sorghum	bu/ac	79.0	103.4	135.0
Soybeans	bu/ac	25.7	33.6	42.0
Alfalfa	T/ac	4.4	5.8	6.6
Pastureland	T/ac	1.8	2.3	3.0
Rangeland	T/ac	0.9	1.2	1.9

South Fork Watershed contains 32,113 acres of prime farmland and an additional 2,302 acres that could be classified as prime farmland except for flooding too frequently.

Oil has been produced from several fields in the watershed. Most have been abandoned or have only one or two wells producing. Potential oil spill problems could develop if abandoned oil wells in the area are reopened.8/ 9/ 10/

Several rock formations, terrace deposits, and the alluvium in the watershed have potential for mineral resources. Of these, only crushed limestone for road construction is being commercially produced.

There are 391 miles of ephemeral, 70 miles of intermittent, and 21 miles of perennial streams in South Fork Watershed. All lakes and ponds total 778 acres of which approximately 280 acres is classified as type 5 wetland. A few acres of type 1, 2, 3, 4, and 6 wetlands also exist in the watershed. Type 3, 4, and 5 wetland exists around and in the small ponds in the watershed upland.31/

Surface water is generally not useable for human consumption without treatment.5/ 8/ 35/ 38/

Ground water is available from two general sources and usually is adequate for rural domestic demands. The major source is the alluvium along the main stem of the South Fork of the Cottonwood; the other is the limestone and shale beds in the Council Grove and Chase Groups. Yields range from 100 gallons per minute to less than 10 GPM. Variation of groundwater quality in this watershed is illustrated by

tests of the USGS Water Resources Data for Kansas.^{8/} Water tested does not meet U.S. Public Health Service Drinking Water Standards for total dissolved solids.

The South Fork of the Cottonwood River and its tributaries are estimated to provide 1,145 total man days of fishing per year.^{17/} Hunting for bobwhite quail, prairie chickens, mourning doves, and white-tailed deer is good during the fall hunting season.

Terrestrial wildlife habitat in the watershed is primarily herbaceous as indicated by Table I, Appendix C. South Fork Watershed also contains some high quality, unique aquatic habitat associated with spring-fed pools and riffles.

The Fish and Wildlife Service has confirmed there are no nationally listed endangered and/or threatened species residing in the watershed.^{29/} Migrant species that may pass through the watershed are the bald eagle and whooping crane. State-listed threatened or endangered species known in or near South Fork Watershed are the Topeka shiner (Notropis topeka), which has been collected from 5 of the 11 proposed dam sites; the Neosho madtom (Noturus placidus), which was collected outside the watershed near the confluence of the South Fork with the Cottonwood River; and the Warty-backed mussel (Quadrula nodulata), collected in 1979, according to the Emporia State University report, although not by Emporia State University staff.^{3/ 7/ 32/} The gravel bar, which is the habitat of the madtom, is not affected by the watershed. The preferred habitat of the Topeka shiner is relatively clear pools in spring-fed reaches, especially in upland areas near headwaters. Topeka shiner streams are frequently intermittent in lower reaches even though those segments where shiners are found are maintained by spring activity.

The State Historical Preservation Officer has confirmed that no listed historic places will be affected by project measures.^{43/} Two sites listed in the National Register of Historic Places are Wood House in Chase County and Crocker Ranch located 1 1/2 miles north of Matfield Green on KS-177.^{13/ 34/} Also listed in the National Register are the Chase County National Bank, the Chase County Courthouse, and the Cartter Building, all in Cottonwood Falls. The Kansas State Archeologist and the Kansas State Historic Preservation Officer ^{15/} have been requested to survey the watershed in accordance with federal regulations. Identification and evaluation studies have been completed.^{14/ 16/ 44/} Thirty-five prehistoric archeological sites were identified and evaluated. Seven of these are considered by SCS and the

State Historic Preservation Officer to be eligible as a district to the National Register of Historic Places. The sites range in age from Early Archaic (beginning 5,500 years ago) through the Late Ceramic period (ending about 300 years ago).

The watershed includes the South Fork of the Cottonwood River from the Cottonwood River to Little Cedar Creek. This stream segment is included in the final list of rivers identified through the National Rivers Inventory Process.^{19/}

Transportation routes in South Fork Watershed are essential to the economy. The watershed is served by a system of secondary roads. Kansas Highway 177 provides a north-south route through the center of the watershed and joins U.S. Highway 50 at the lower end. The Atchison-Topeka and Santa Fe Railroad runs parallel to U.S. 50 across the northern tip of the watershed and up the flood plain parallel to Highway 177. The Kansas Turnpike crosses the watershed above Matfield Green in a southwest to northeast direction.

In 1978 approximately 11 percent of Chase, Butler, and Greenwood County farms had gross sales less than \$2,500, and 35 percent of the farmers worked 100 or more days off the farm. Although many farmers have low gross sales and maintain off-farm jobs, most of the land in the watershed is controlled by operators who do not work off the farm and whose operations gross over \$10,000 per year. Over 11 percent of the watershed population is below the low income level. Per capita income for the watershed counties is below state and national averages.^{27/}

Forecasted Changes*

Without the project, severe flooding will continue. Eighteen detention dams are expected to be built, and farmers will apply recommended land treatment measures on another 15,760 acres of cropland and rangeland. This investment will reduce flood damages about 9.0 percent. Farmers will continue to plant grass, alfalfa, and wheat on the frequently flooded areas. Livestock will continue to be kept off the flood plain during the flood season.

New bridges across South Fork will be designed to accommodate floods. Bridge approaches will be lower than

*Conditions described in this section are considered in place as a basis for evaluating effects of alternative plans.

bridge decks so flood water can go around. Bridge construction and maintenance cost will be much greater than if flooding were controlled. Scour channels will continue to enlarge. Some scoured areas will be converted to grassland.

Land use in South Fork Watershed will remain about the same as the present land use, shown in Table C on page 14. The only change expected is the use of about 200 acres of rangeland for other land (water) as a result of detention dams (state watershed program terminology describing flood retarding dams generally smaller than P.L. 566-funded dams) to be installed by the watershed district.

Detention dams will inundate some prime farmland, but their impact on flooding is expected to increase prime farmland by 198 acres. The watershed land is expected to remain in agricultural uses; hence no prime farmland will be converted to any other uses.

Farmers and stockmen will continue to haul water during extremely dry periods. Some farmers will benefit from the available water in the detention dams. Water supply needs will probably be met by a lake closer to the source of need, a more economical source piped into the area, and possibly wells.26/

Presently 94,730 acres of rangeland are adequately protected. The going programs will increase this to 110,490 acres by the end of the project installation period. Practices to be installed include: proper grazing use, planned grazing systems, brush control, ponds, and range seeding.

FORMULATION OF ALTERNATIVES

General

Two broad objectives, national economic development (NED) and environmental quality (EQ), guided planning. The NED objective is to increase the value of the nation's output of economic goods and services or to improve economic efficiency. The EQ objective is to conserve and/or preserve the nonmonetary (intangible) aspects of man's surroundings such as cultural resources, ecological systems, or natural resource qualities.

Early in the formulation process, sponsors listed the problems and opportunities in the watershed. The major problem is reduced agricultural income directly related to

flooding and erosion. Measures were then considered to reduce flood damages and erosion. Nonstructural measures were considered, but none other than those practices already being used were found to increase agricultural income. Floodwater retarding dams combined with land treatment will decrease flood damages, reduce erosion, and as a result provide the flood control needed for an increase in agricultural income.

Improvement of rangeland and bottomland hardwood wildlife habitat for environmental quality could best be accomplished by improved management practices.

Five alternatives were formulated by combining various measures to solve problems and realize opportunities. These alternatives are: (1) No Project, the going conservation program including additional farm ponds and district-funded detention dams; (2) NED plan, including 11 floodwater retarding dams and accelerated land treatment, and mitigation of terrestrial and aquatic habitat losses; (3) EQ plan, including improvement of 90 percent of the rangeland to good condition and restricting livestock use of woodland habitat; (4) a primarily nonstructural plan; and (5) the recommended plan is the same as the NED plan which includes 11 floodwater retarding dams, wildlife habitat improvement on rangeland and bottomland woodlands, and compensation of terrestrial and aquatic habitat losses.

A comparison of the alternatives shows that Alternative 5 solves the major problem by decreasing flood damages and erosion damages to the extent of the NED plan, while improving the quality of the environment to the extent of the NED and EQ plans. It is therefore the Recommended Plan.

Formulation Process

Project scoping began with a list of those measures that would help achieve or could be expected to satisfy one or more of the problems or opportunities. A preliminary analysis was then made of the relative impact of each measure under consideration, compared to goals set by sponsors and other planners. Table F on the following page summarizes the result of this effort. Table F shows the basis for selection of combinations of measures to be included in alternative plans. It also displays reasons some measures were not studied further.

Nonstructural measures were considered, including: (1) land treatment, (2) changes in flood plain land use and/or management, and (3) changes in upland land use and/or

Table F - Measures to Satisfy Problems and Opportunities

<u>Problems and Opportunities</u>	<u>Accelerated Land Treatment</u>	<u>Flood Plain Changed Land Use and/or Management</u>	<u>Upland Changed Land Use and/or Management</u>	<u>Floodwater Retarding Dam^{a/}</u>	<u>Multi-purpose Dam^{a/}</u>
To increase farm income:					
Reduce scour damages on 2,356 acres	N	-	-	+	+
Reduce crop and pasture flood damages on 8,445 acres by 57 percent	N	-	-	+	+
Improve value of native rangeland	+	N	+	N	N
Protect 162,800 acres grass and woods from wildfires	+	N	N	N	N
Reduce crop production costs from soil loss	N	N	N	+	+
To reduce maintenance costs:					
On roads and bridges	N	N	N	+	+
On railroads	N	N	N	+	+
To reduce farm income losses:					
Reduce flooding on farms	N	N	N	+	+
Reduce crop production costs from soil loss	N	N	N	+	+
To increase sport fisheries:	N	N	N	+	+
To develop water supply: (Provide 0.82 MGD)	N	N	N	N	+
To enhance environmental or social values:					
Protect public safety on main roads	N	N	N	+	+
Manage bottomland woodlands for wildlife	+	+	N	N	N
Manage native rangeland for wildlife	+	N	+	N	N
Maintain high quality, unique aquatic habitat for Topeka shiner	+	N	+	N	N
Reduce scour damage on 2,356 acres	+	+	N	+	+
Reduce soil loss	+	+	+	+	+
Increase fire protection on 162,800 acres	+	N	N	+	+
(+) Favorable Impact (N) No Impact or Negligible Impact (-) Adverse Impact					

^{a/} Including compensation for fish and wildlife losses

management. Flood plain changes included: (a) changing cropping pattern from high-income crops to more flood-tolerant, lower-income crops, (b) changing cropping patterns from flood-tolerant, lower-income crops to less flood-tolerant, higher-income crops, and (c) changes in management of bottomland woodlands. Upland changes included: (a) changes in management of native rangeland, and (b) changes from grassland to cropland. The effects of these nonstructural measures were considered on each of the goals listed in Table F. Some measures satisfied more than one objective.

Investigations were made to determine how much land treatment had been applied and the number of units left to be applied. This investigation found that about 60 percent of the rangeland and 66 percent of the cropland had adequate protection. Pastureland was 74 percent adequately protected. The going land treatment program would provide the technical assistance to help farmers and ranchers apply most of the cropland treatment practices needed by 1992. Tests were made to determine the effects of this additional land treatment. The evaluation consisted of measuring flood damage reduction benefits from land treatment and establishing the remaining damage.

Because of the intensity of flooding on the South Fork flood plain, many local farmers have already adopted a cropping pattern of more flood-tolerant crops, such as alfalfa and pasture, over high income crops, such as corn and soybeans, to the extent that such change is economically feasible. This measure reduces scour damages and crop damages, but also reduces farm income and crop yields. Further change of cropping patterns in this direction does not satisfy the NED objective and was not considered further.

Changing the current flood plain cropping patterns from water-tolerant, low-income crops to higher-income row crops would result in greater farm income if it were not for increased crop and scour damages. This measure has proven to be uneconomical without some means to reduce flooding.

Changes in upland use and/or management to improve the value of native rangeland to good or better condition would satisfy the EQ objective of improving wildlife habitat. Changing upland rangeland to cropland to increase income is not feasible because much of the rangeland is on steep, rocky soils not suitable for farming. This measure would not satisfy NED objectives and was not considered further.

The nonstructural measures of improving management of riparian woodlands and upland rangeland were included in the

EQ plan, the NED plan, and in the Recommended Plan. Other nonstructural measures were not economically or environmentally feasible.

Floodwater retarding dams and a multipurpose reservoir for water supply and flood control would solve many of the same problems. They would increase farm income by reducing scour damages and reducing crop and pasture damages. They would reduce maintenance costs on roads, bridges, and railroads. They would reduce losses to farm income from flooding. They could have favorable impacts on sport fisheries. A multipurpose reservoir could provide a water supply for Strong City and Cottonwood Falls. The structural measures would benefit the environment by reducing soil loss and protecting public safety on the main roads. They would have no adverse effects on any objective. Therefore, structural measures were considered the best alternative to satisfy the most goals and were evaluated to determine the number and placement of structures to best satisfy the objectives.

The sponsors requested the Soil Conservation Service to evaluate the 26 floodwater retarding dams listed in the South Fork Watershed General Plan. 22/ Preliminary geologic and engineering investigations were made and costs were estimated. Beneficial effects were identified and distributed to each dam. An array of dams from the most feasible to the least feasible was used to identify the best structural system. Several incremental hydrologic and economic analyses were made to determine the best system to reduce flood peaks and yield positive net benefits. Table G shows the results of this evaluation. The Alternatives Map following this page shows the location of dams analyzed in formulation of the project.

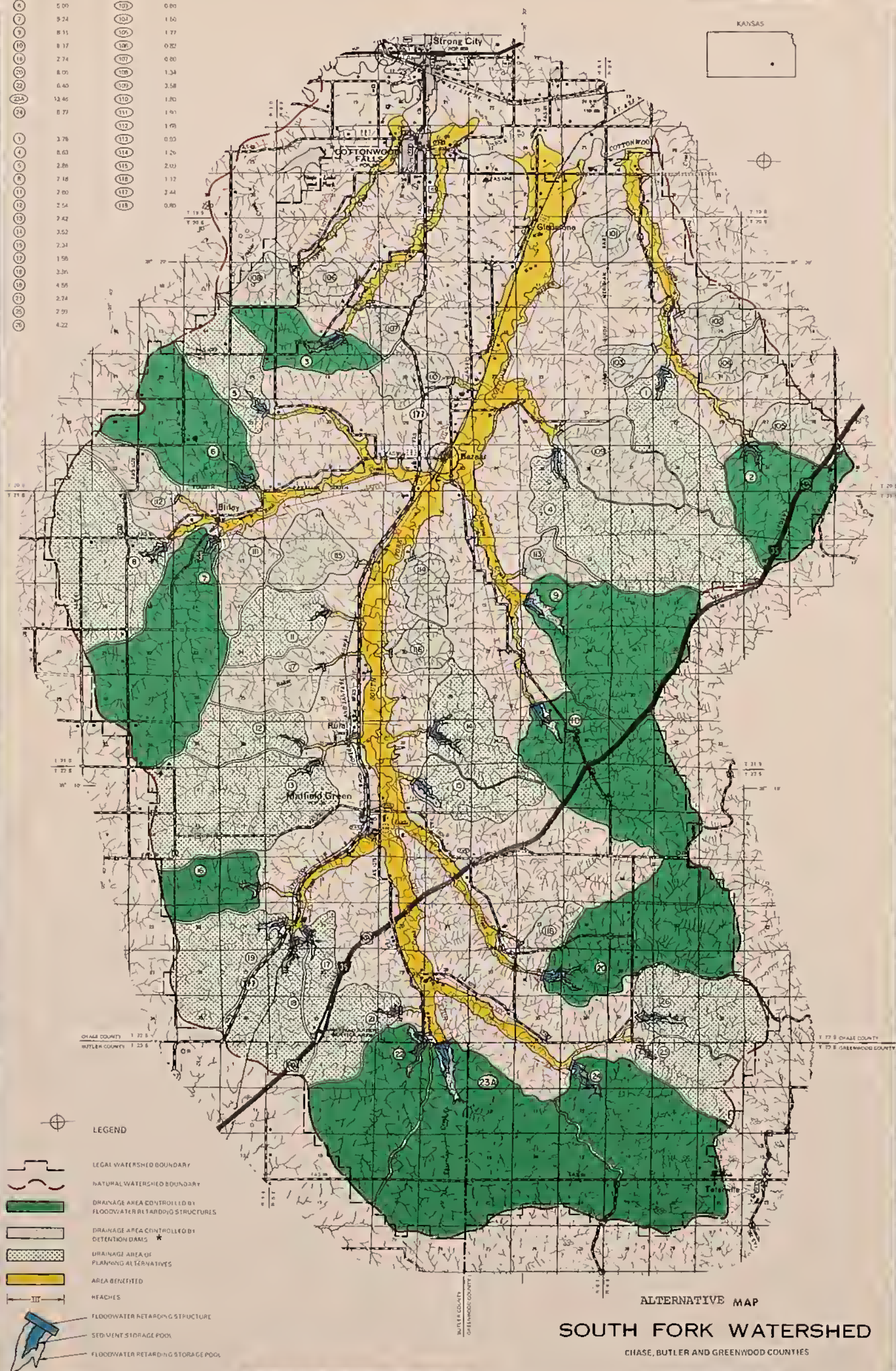
Due to the shape and size of this watershed, a double flood peak usually occurs near Bazaar where two large tributaries converge with the main channel. These two tributaries can generate flood flows to equal or exceed main channel flows. It was found by studying plotted hydrographs that two dams, one located in the upper portion of the watershed and one in the lower portion, must be evaluated together to reduce both flood peaks.

DRAINAGE AREA IN SQUARE MILES

2	4.56	101	1.12
3	2.08	102	1.34
4	5.00	103	0.80
5	5.24	104	1.50
6	8.11	105	1.77
7	8.17	106	0.82
8	2.74	107	0.80
9	8.05	108	1.34
10	0.40	109	3.58
11	12.46	110	1.80
12	8.77	111	1.41
13		112	1.45
14	3.78	113	0.53
15	8.63	114	1.26
16	2.86	115	2.03
17	7.18	116	1.12
18	2.80	117	2.44
19	2.54	118	0.80
20	2.42		
21	3.52		
22	2.34		
23	1.59		
24	2.36		
25	4.56		
26	2.74		
27	2.93		
28	4.22		

SCALE 0 1 2 3 MILES

KANSAS



ALTERNATIVE MAP

SOUTH FORK WATERSHED

CHASE, BUTLER AND GREENWOOD COUNTIES

*STATE TERMINOLOGY FOR NON-P.L.
566 FLOODWATER RETARDING DAMS

PREPARED BY: BUCHER AND WALLS
CONSULTING ENGINEERS, PLANNERS
AND ARCHITECTS, FORT SMITH, ARK.
BY COMMISSIONERS OF CHASE,
BUTLER, AND GREENWOOD COUNTIES

SEPTEMBER, 1962

Table G - Incremental Costs and Benefits

<u>Dams Numbers</u>	<u>Total Costs</u>	<u>Incremental Costs</u>	<u>Total Benefits</u>	<u>Incremental Benefits</u>	<u>Net Benefits</u>
23A & 7	121,700	121,700	162,900	162,900	41,200
24 & 9					
23A & 7	206,300	84,600	280,200	117,300	73,900
22 & 6					
24 & 9					
23A & 7	285,500	79,200	380,700	100,500	95,200
20 & 10					
22 & 6					
24 & 9					
23A & 7	388,700	103,200	497,200	116,500	108,500
16					
20 & 10					
22 & 6					
24 & 9					
23A & 7	407,400	18,700	516,900	19,700	109,500
16 & 19					
20 & 10					
22 & 6					
24 & 9					
23A & 7	447,800	40,400	546,800	29,900	99,000

The NED plan includes 9 dams on the main channel. Table G shows that eliminating 1 dam to use an 8-dam system reduces costs by \$18,700, but reduces benefits by \$19,700. Conversely, using a 10-dam system would increase costs by \$40,400 and increase benefits by only \$29,900. Dams 1 and 3 located on adjacent streams have benefits in excess of costs and are added to the nine dams resulting in a total of 11 dams. The accelerated land treatment, initially formulated to be the environmental quality alternative, has also been evaluated under NED guidelines. Benefits exceed costs for the combined land treatment which is therefore added to the NED alternative. Maximum net benefits are achieved using the 11-dam system and accelerated land treatment.

A study of regional water supply systems 26/ included reservoir sites in South Fork as well as other watersheds in the area. The study showed sites outside South Fork to be closer and more economical as a source for the 0.82 MGD needed.

Consideration was given to enlarging some reservoirs to enhance sport fishery both at the sites and downstream by water releases during dry periods. There was no sponsor found to provide additional money for land rights and construction.

Environmental concerns in the watershed were investigated. The Topeka shiner is native to Kansas and is included on the Kansas threatened species list. Current known habitat requirements of this species were identified and precautionary measures considered in formulation of alternatives.

Wildlife would benefit and rangeland would produce more income by improving all rangeland to good condition. This wildlife habitat improvement would be accomplished through a technical information program including examples and on-site ranch planning showing the benefits to wildlife and livestock operations. Rangeland improvement practices include: proper grazing use, planned grazing systems, range seeding, brush control and ponds. These improvements should increase farm income.

Intensive grazing or livestock wintering in woodland largely eliminates wildlife use. Consideration was given to restrict livestock access to woodland areas. Presently woodland is used by livestock for shade in summer and protection from cold winds during winter.

Evaluation of Alternatives

Alternatives considered during planning are described in this section. Costs and other economic, environmental, and social impacts of greatest significance to decision-making are compared in Table H, pages 29-30.

ALTERNATIVE 1 - NO PROJECT

Components: This alternative consists of continuing the present conservation program without project action. Practices would be installed on 15,760 acres of grassland.

Costs: There would be no project costs, either P.L. 566 or other, for this alternative.

Effects: There would be no project benefits or effects for this alternative. Without project action farm owners and operators would not be able to realize the highest income potential from the frequently flooded areas. Flooding and problems associated with flooding would continue as flood damages would not be appreciatively reduced by the going program.

ALTERNATIVE 2 - NATIONAL ECONOMIC DEVELOPMENT PLAN
(See Project Map Appendix D)

Components: This alternative consists of installing 11 floodwater retarding dams, full compensation for woody wildlife losses, and provisions for maintaining aquatic habitat of the Topeka shiner. The plan also includes partial compensation for herbaceous wildlife habitat losses. The dams will detain a total 14,630 acre feet of floodwater. The height of the dams will range from 29 to 49 feet. All the dams have been classified at the lowest hazard to human life (class a). This alternate also consists of: (1) offering accelerated technical assistance to bring 90 percent of the rangeland to a good condition, and (2) offering a program of woodland habitat management along upper tributaries according to the following criteria: (a) it must be a specific area where the landowner is willing to donate an easement, (b) public access would continue to be controlled by the landowner, (c) an informational program concerning the advantage of controlled grazing of woodland habitat along upper tributaries would be initiated, (d) operation and maintenance would be the responsibility of the watershed district, and (e) 50 percent cost sharing of any fences required would be available through the going program.

Woodland habitat along upper tributaries totaling 250 acres and 31,245 acres of rangeland would be improved as terrestrial wildlife habitat.

Forestry Plan measures were also included in this alternative. Forest management on 500 acres and fire control measures on 162,800 acres are the main measures of this plan (see Alternative 3 for description).

Costs: Total project costs - \$6,335,800; P.L. 566 share - \$5,515,100; other - \$820,700. The average annual cost is \$555,200 which becomes \$386,500 by discounting to the beginning of the period of analysis.

Effects: Installation of this alternative will provide flood protection for 8,445 acres of flood plain, including 7,214 acres of this is cropland. The accelerated land treatment will increase production on 31,245 acres of rangeland. Average annual benefits of \$782,500 will accrue. Average annual benefits discounted to the beginning of the period of analysis will be \$546,000.

Flood damages to crop and pasture will be reduced 57 percent. Flood plain farmers will realize an 18 percent increase in yields due to more intensive farming. Flood plain scour will be reduced 44 percent. Total sediment

yield to the Cottonwood River will be reduced 13,960 tons. Rangeland production will increase 51 percent on the 31,245 acres treated by accelerated land treatment.

ALTERNATIVE 3 - ENVIRONMENTAL QUALITY PLAN

Components: This alternate consists of accelerated land treatment including (1) offering accelerated technical assistance to bring 90 percent of the rangeland to a good condition, and (2) offering a program of woodland habitat management along upper tributaries according to the following criteria: (a) it must be a specific area where the landowner is willing to donate an easement, (b) public access would continue to be controlled by the landowner, (c) an informational program concerning the advantage of controlled grazing of woodland habitat along upper tributaries would be initiated, (d) operation and maintenance would be the responsibility of the watershed district, and (e) 50 percent cost sharing of any fences required would be available through the going program.

Woodland habitat along upper tributaries totaling 250 acres and 31,245 acres of rangeland would be improved as terrestrial wildlife habitat.

Forestry Plan measures were also included in this alternative. Forest management on 500 acres and fire control measures on 162,800 acres are the main measures of this plan. Forest management consists of prescribed timber harvest and reinforcement planting in woodlands. Fire control measures are (1) improved fire control equipment, (2) training of fire district volunteers, (3) development of fire prevention programs, (4) scheduling and coordination of prescribed range burning, and (5) strengthening of cooperative agreements between districts.

Costs: Total project costs - \$691,800; P.L. 566 share - \$148,500; other - \$543,300; average annual costs - \$93,400; average annual costs discounted to the beginning of the period of analysis - \$63,100.

Effects: Installation of this alternative will increase watershed wildlife habitat units. Woodland habitat will increase 750 habitat units. Rangeland habitat will increase 135,915 habitat units. Aquatic habitat will increase 384 habitat units. Total increase in habitat units is 137,049 (see Table I, Appendix A). Average annual benefits will be \$203,700. Average annual benefits discounted to the beginning of the period of analysis will be \$137,400.

The Forestry Plan outlines steps for removing over mature trees to provide room for seedling and sapling age classes. This will enhance and diversify the total over-story. Fire control measures will reduce the incidence of wildfires. Benefits for the plan were not quantified because of the uncertainty of participation, harvest time, rate of growth, and quality of habitat.

Wildlife habitat potential will be increased on 31,245 acres. There will be increased diversity in the watershed habitat provided by 60 ponds and a variety in woodlands. Watershed residents and people traveling through the area will be better protected from uncontrolled rangeland fires. Livestock production will be increased on improved rangeland. Secondary benefits of \$203,700 annually will be realized for the increased range rental value.

ALTERNATIVE 4 - PRIMARILY NONSTRUCTURAL PLAN

Components: There were no viable nonstructural measures found that would reduce flood damages and produce benefits in excess of costs. The evaluated measures consist of planting grass on cropland that floods more frequently than once a year and relocating the main roads above the 100-year flood plain.

Conversion of additional cropland to grassland is not economical. Expected net crop income under flooding conditions exceeds net income from grassland.

Relocating the main roads (FAS 1918, FAS 9, and FAS 91) would not relieve the need to maintain many miles of the old road for ranch and farm needs; therefore, total road mileage would increase. In addition, a new road above the flood plain would have to be located on rolling hills, causing construction and maintenance to be more costly than maintenance of the old road.

As there are no feasible nonstructural means to increase agricultural income through reduced flooding, this alternative was not considered further.

ALTERNATIVE 5 - RECOMMENDED PLAN (See Project Map Appendix D)

Components: This alternative consists of all of the elements of the NED alternative; building 11 floodwater retarding dams with compensation; improving 90 percent of the rangeland to a good condition; restricting livestock use of woodland habitat along upper tributaries according to the specific criteria set forth in the NED plan; and forest management and fire control as set forth in the Forestry Work Plan.

Costs: The project cost - \$6,335,800; P. L. 566 costs - \$5,515,100; other - \$820,700; average annual costs - \$555,200; average annual costs discounted to the beginning of the period of analysis - \$386,500.

Effects: Installation of this alternative will provide all the flood protection benefits of the NED alternative. Additionally, all benefits of the EQ alternative will be realized. The project's average annual benefits are \$782,500; average annual benefits discounted to the beginning of the period of analysis - \$546,000.

Flood damages to the total watershed will be reduced 56 percent. Scour damage to the flood plain will be reduced 62 percent. Total sediment yield to the Cottonwood River will be reduced 17,233 tons. Wildlife habitat will be improved by 138,324 habitat units over no-project conditions. Watershed residents and people traveling through the watershed will be better protected from uncontrolled rangeland fires.

Comparison of Alternatives

Alternative 1 (No Project) would not solve the agricultural income problems related to flooding so the sponsors did not consider it a desirable alternative.

Alternative 2 (NED) offers the best flood protection, most net economic benefits, most prime farmland, most reduction in flood plain scour, and greatest increase in agricultural income.

Alternative 3 (EQ) offers the most benefit to terrestrial wildlife.

Alternative 4 (primarily nonstructural) would not increase agricultural income or produce benefits in excess of costs and is not considered a viable alternative.

Alternative 5 (recommended plan) includes both the maximum flood control offered by the NED plan and the improved wildlife habitat elements and increased grazing offered by the EQ and NED plans. It increases agricultural income and provides benefits in excess of costs. Sponsors recommend its selection.

Table H, pages 29 and 30, compares the impacts of each viable alternative on factors significant to decisionmaking

Risk and Uncertainty

The EQ and the NED plans include elements to improve the range condition from fair to good for increased wildlife habitat. This range improvement will also increase livestock

Table H - Summary and Comparison of Candidate Plans

Effects	Alternative 1 (w/o project)	Alternative 2 (NED)	Alternative 3 (EQ)	Alternative 4 (recommended)
Measures	--	11 Floodwater Retarding Dams with Compensation plus Accelerated Land Treatment including 31,245 acres Rangeland Improvement ^{b/} ; 250 ac. Wildlife Upland Habitat Mngt.; 500 ac. Forest Mngt.; and 162,800 ac. Fire Control	Accelerated land treatment including 31,245 acres Rangeland Improvement ^{b/} ; 250 ac. Wildlife Upland Habitat Mngt.; 500 ac. Forest Mngt.; and 162,800 ac. Fire Control	All NED measures
Project Investment	0	\$6,335,800	\$691,800 ^{c/}	\$6,335,800
<u>NATIONAL ECONOMIC DEVELOPMENT ACCOUNT^{e/}</u>				
Adverse, Annualized	--	\$ 555,200	\$ 93,400	\$ 555,200
Beneficial, Annualized	--	\$ 782,500	\$203,700	\$ 782,500
Net Beneficial	--	\$ 227,300	\$110,300	\$ 227,300
<u>ENVIRONMENTAL QUALITY ACCOUNT</u>				
<u>Beneficial</u>				
Increase landscape diversity with water in sediment pools - no. of lakes	No effect	11 Floodwater Retarding Dams and 60 small ponds for rangeland improvement for wildlife	60 small ponds for rangeland improvement for wildlife	All NED items
Warm water fishing lakes in the sediment pools - acres	No effect	361 surface acres with 19.6 miles of shoreline	60 surface acres with 1.1 miles of shoreline	361 surface acres with 19.6 miles of shoreline
Storage water available for fire control - acre feet	No effect	Maximum of 1,743 acre feet in sediment pools	Approximately 200 acre feet in small ponds	Approximately 1,743 acre feet maximum available
Wildlife Upland Habitat Changes				
Woodland Habitat Units ^{a/}	0	750	+ 750	+ 750
Pastureland Habitat Units ^{a/}	0	0	0	0
Rangeland Habitat Units ^{a/}	0	135,807	+135,915	+ 135,807
Aquatic Habitat Changes				
Pond (flatwater) units	0	2,189	+ 334	+ 2,189
<u>Adverse</u>				
Convert terrestrial habitat to aquatic habitat - acres	No effect	361	60	361
Wildlife Upland Habitat Cropland Habitat Units	0	- 306	0	- 306
Aquatic Habitat Stream Habitat Units	0	- 116	0	- 116
Convert perennial stream to permanent water - miles	0	1.5	0	1.5
Convert intermittent stream to permanent water - miles	No effect	8.4	0.3	8.4
Convert ephemeral stream to permanent water - miles	No effect	0.8	0	0.8
Changes landscape with man-made structures - no of dams	No effect	11 moderately visible dams and 60 dams with minor visibility	60 dams with minor visibility	Same as NED
Land Use - Changes - acres				
Cropland	0	- 102	0	- 102
Pastureland	0	0	0	0
Native Pasture	0	- 250	- 250	- 250
Rangeland	0	- 327	72	- 327
Wildlife Land	0	+ 337	+ 262	+ 337
Woodland	0	0	0	0
Transportation Services	0	0	0	0
Farmsteads and Residential	0	0	0	0
Other (water)	0	+ 342	+ 60	+ 342

Table H - Summary and Comparison of Candidate Plans, continued

Effects	Alternative 1 (w/o project)	Alternative 2 (NED)	Alternative 3 (EQ)	Alternative 4 (Recommended)
<u>OTHER SOCIAL EFFECTS ACCOUNT</u>				
Flood Damage Reduction on 8,445 acres - percent	0	56	d/	56
Peak Flood Flow Reduction at Watershed Outlet - percent	0	36	0	36
Prime Farmland	32,113	33,315	32,113	33,315
Flood Plain Scour Erosion - tons per year	19,950	7,580	19,950	7,580
- percent reduction	0	62	0	62
Total Sediment Yield to Cottonwood River - tons per year	57,984	40,751	54,984	40,751
Real Income Distribution				
Create a net increase of low to medium income permanent jobs for area residents - man years	No effect	47.5	4.3	47.5
Create regional income benefits - dollars	No effect	1,714,500	650,800	1,714,500
Local costs to be borne by region - dollars (distributed same as regional income benefits)	No effect	104,600	66,100	104,600
<u>REGIONAL ECONOMIC DEVELOPMENT ACCOUNT e/</u>				
Positive Effect				
Annualized				
Region	--	1,379,800	479,100	1,379,800
Rest of Nation	--	0	0	0
Negative Effect				
Annualized				
Region	--	104,600	66,100	104,600
Rest of Nation	--	723,200	16,900	723,200
Net Effect				
Annualized				
Region	--	1,275,200	413,000	1,275,200
Rest of Nation	--	723,200	- 16,900	- 723,200
Employment				
Project Construction - man years	--	142.0	14.0	142.0
Project Operation and Maintenance - man years	--	1.4	1.0	1.4
Agricultural - man years	--	45.9	17.1	45.9
Indirect from Project Construction man years	--	13.8	5.1	13.8

a/ Including compensation

b/ Includes the following practices and quantity: brush control - 2,000 acres; range seeding - 1,200 acres; planned grazing systems and proper grazing use - 31,245 acres; and stockwater ponds - 60

c/ Includes \$148,500 P.L. 566 technical assistance and \$543,300 from sources other than P.L. 566.

d/ Damage reduction effects of EQ land treatment program were not evaluated.

e/ Includes effects of interest during the construction period.

forage. As ranchers realize the additional beef production they may change their operations to achieve an excellent rather than good range condition. If this occurs less wildlife habitat may be developed.

Another uncertainty is the number of treated acres. Willing ranchers must be found to adopt the plan. Therefore, the actual acres treated will be dependent upon finding willing ranchers and entering into cooperative agreements for the specific areas needing treatment. If none of these acres were improved, there would be about 68,770 terrestrial habitat units foregone. If all of the 15,734 acres of rangeland were treated and none of the woodland, then 750 habitat units would be foregone. Conversely, if the 250 acres of woodland were treated and none of the rangeland, then 68,020 terrestrial habitat units would be foregone.

The NED plan includes only flood control dams that have incremental benefits exceeding costs. Topeka shiners, a state threatened fish species, were found at five of the proposed dam sites. Several methods are being considered to mitigate loss of habitat at these sites. One possibility involves a cooperative study by the Kansas Fish and Game Commission, Soil Conservation Service, and Emporia State College to determine if the Topeka shiner can be transplanted to other PL-566 dams and stream locations. At this time it is uncertain whether transplanting will be successful. If structures 2, 10, 16, 20, and 24 are not built because of the Topeka shiner, flood damage reduction benefits of \$234,800 would be foregone. Likewise, annual costs would be reduced by \$190,300. The drainage area controlled would be reduced from 77.5 square miles to 45.2 square miles. Damage reduction benefits would be reduced to 33 percent, instead of 56 percent, resulting in project benefits (without interest) of \$337,600 instead of \$578,800.

Another possible consideration is to create artificial springs below affected dam sites. Small diameter pipes could be installed through the dams to release water as needed into the stream, as from a spring. This design alternative would add a small amount to the construction expense, but was not evaluated.

The recommended plan has the same risk and uncertainty as discussed above in the NED plan.

Rationale for Plan Selection

The primary objectives of the planning process were to reduce damages due to flooding and erosion and to increase or improve the habitat for wildlife in the watershed. The

recommended plan contains elements to achieve all primary objectives. Water supply and recreation were considered in plan selection but neither were adopted for lack of a sponsor.

RECOMMENDED PLAN

Purpose and Summary

The project is planned for flood prevention and watershed protection. This section discusses the recommended project features, costs, financing, installation, required permits, operation and maintenance, and replacement. The project will significantly reduce flood damages to agricultural properties and improve travel routes. Planned measures are described below. For additional details about the recommended plan, see Tables 1, 2, and 3 and the Project Map (Appendix D).

Plan Elements

Conservation districts will provide technical assistance to landowners to attempt to increase 90 percent of the rangeland to good or better condition. The practices involved are seeding, ponds, brush management, proper grazing use, planned grazing systems, and wildlife upland habitat management. Accelerated technical assistance will be provided by the Soil Conservation Service to plan, design, and install these practices.

Accelerated land treatment will be applied on 31,245 acres of rangeland and forest management applied on 500 acres of forest land. Fire control is planned for 162,800 acres of rangeland and forest land. Installation cost-sharing assistance for needed practices will be provided from sources other than P.L. 566.

Forest management consists of prescribed timber harvest and reinforcement planting in woodlands. Fire control measures are (1) improved fire control equipment, (2) training of fire district volunteers, (3) development of fire prevention programs (4) scheduling and coordination of prescribed range burning, and (5) strengthening of cooperative agreements between districts.

About 1,200 acres of range will be seeded. This is land that was formerly cropped and has been allowed to go back to grass, but warm-season grasses have not reestablished themselves.

Sixty stockwater ponds or spring developments will be built for livestock water needed at specific locations to

help get better livestock grazing distribution. At least 6 of these ponds will be fenced and managed for wildlife purposes by the landowner.

Brush control or management will be applied on 2,000 acres. A combination of mowing, cutting, burning, and herbicide application (according to label directions) will be used by ranchers. Precautions will be taken to comply with state pesticide and air pollution controls. Wildlife needs will be considered when applying this practice.

Overgrazing will be avoided and planned grazing systems will be established on 31,245 acres of rangeland. For example, a section of rangeland might be divided into three or four grazing units. Each unit might then be grazed during a specific season one year and the next year grazed during a different season, or double stocked early and rested the last half of the growing season.

The watershed district will offer assistance to landowners on a voluntary basis to restrict livestock use of selected tributary woodland areas. This measure is dependent upon ranchers' willingness to manage these areas for wildlife use. Several small tracts totaling about 250 acres would be granted easements for wildlife management purposes.

Eleven floodwater retarding dams will be installed. See Project Map (Appendix D) for dam locations.

Each dam will have a drop-inlet type principal spillway of reinforced concrete. (A typical dam with a single-stage reinforced concrete principal spillway is shown in Appendix B.) Release rates will average about 11 cubic feet per second per square mile (CSM) and will not exceed present downstream channel capacities. Stilling basins at principal spillway outlets will dissipate energy and minimize erosion.

The dams will be earth fill with vegetated emergency spillways to pass runoff safely when reservoir and principal spillway capacities are exceeded. In any one year the chance of operation of the emergency spillway at any site is 4 percent or less. Emergency spillways of some structures will require topsoiling to establish and maintain vegetation. Dams and spillways will be planted to native grass and forbs and managed for erosion control and wildlife in accordance with a vegetation management plan.

The 11 dams will provide floodwater retarding storage varying from 2.99 to 3.82 inches of runoff. Runoff from 77.7 square miles, 27 percent of the watershed, will be

controlled. The combined volume of retarding storage will be 14,630 acre feet (equivalent to 3.53 inches runoff from the drainage area controlled) with a combined temporary flood storage surface area of 1,323 acres.

All dams are designed for 100-year accumulation of sediment below the principal spillway crest. Sediment storage capacity varies from 0.36 to 0.52 inches. Combined sediment storage volume for all dams will total 1,718 acre feet. Combined surface area of the sediment pools will total 301 acres.

Where suitable construction material is available, borrow areas will be confined to sediment pools and emergency spillway excavations. Where practical, borrow areas will be left rough and uneven to enhance fish habitat. Borrow material at most dam sites will be CL or CH (Unified Soil Classification System). Sponsors may request some timber be left in the sediment pools to improve fish habitat.

Most of the floodwater retarding dams are on alluvium in narrow valleys. The alluvium is generally less than 20 feet deep. Depth of soils in most abutments does not exceed 3 feet.

Effects on Existing Physical Features

Project installation will affect a road at Dam No. 10. Road modification cost is estimated to be \$600. Damages to roads and bridges both in the watershed and along the Cottonwood River will be reduced.

Fish and Wildlife Habitat Mitigation

Project installation will result in a loss of 653.7 habitat units of woodland and 1,347.7 habitat units of herbaceous habitat. These losses will be mitigated by compensating with plantings of grasses, trees, and shrubs.

Table II, Appendix C, shows the acreage of land, by dam site, that sponsors will provide for compensation of wildlife habitat losses. Compensation measures will be located in the general vicinity of each structure; however, the actual location will be determined during land rights acquisition. Landowners' wishes will be considered in locating the wildlife habitat compensation measures. Wildlife habitat compensation measures include establishment and management of native grass and forbs on 75 acres of dams and spillways, and woody plantings on 87.2 acres or retention and improvement of existing riparian woodland habitat on 218 acres. A combination of woody planting and retention may be used.

The conversion of 10.7 miles of streams to permanent water necessitates mitigation of the Topeka shiner habitat. This includes transplanting the species to locations with similar habitat in the watershed.^{3/ 41/} This is a joint measure by the Kansas Fish and Game Commission and Emporia State University. The dams where Topeka shiners have been found (2, 10, 16, 20, and 24) are to be built last, giving the transplanting time to become effective. If the transplanting is not successful, the sponsors will consider other options such as: dry dams, construction of substitute sites, or deletion of structures 2, 10, 16, 20, and 24 from the plan. These alternatives were developed jointly with the Kansas Fish and Game Commission.

Cultural Resources

Seven archeological sites are considered eligible for listing in the National Register as a district. The sites are important for the information they contain about past cultures living in the region. Three sites, 14BU355, 14BU360, and 14CS399, will be adversely affected by installation of Dam No. 23A. They contain information very similar to each other and to the four remaining sites. The latter will be reasonably preserved after project installation.

Impacts to site 14CS399 will be avoided by limiting construction use to an existing farm lane. Impacts to sites 14BU355 and 14BU360 will be adequately mitigated by excavation of a sample of the significant information they contain or by sampling the unique information which is not duplicated at the remaining sites. A mitigation plan will be developed through consultation between the SCS, sponsors, the State Historic Preservation Officer, and the Advisory Council on Historic Preservation. Due to the combination of avoidance, preservation in place, and excavation, the project will have no adverse effect on cultural resources.
45/

Permits Required

A construction permit will be needed from the State of Kansas for each structural measure in the project. No federal 404 (Section 404 of P.L. 92-500) permits are required for any project measure since all are located on streams having average flow of less than 5 cfs. A project action permit from the Kansas Fish and Game Commission will also be required for sites which will destroy Topeka shiners or their habitat.

Dam Safety

In the event of failure, damage to the area downstream of a class "a" dam would be limited to farm buildings, agricultural land, or township and county roads. A greater hazard potential could be created if additional development occurs in the breach inundation area of any dam. The hazard classification would then become either class "b" or class "c". For class "b" dams, damage would be limited to isolated homes, main highways, minor railroads, or interruption of service of relatively important public utilities. And for class "c" dams, loss of life or serious damage to homes, industrial and commercial buildings, important public utilities, main highways, or railroads could occur.

Class "a" dams are planned to have the least amount of floodwater retarding storage, class "b" dams contain intermediate storage, and class "c" dams the greatest amount of storage. Having less storage, class "a" dams have the greatest potential to be overtopped by extreme floods. Class "c" dams are planned to safely pass the maximum probable flood without overtopping but could fail from other causes, and would pose greater danger in case of failure. Other things being equal, failure of a dam with greater storage can cause more damage than one with lesser storage.

Overtopping is just one type of failure; any dam can fail for other reasons unless properly designed, constructed, operated, and maintained. Examples of the most common failures listed in the order most likely to occur, based on historical records (Engineering News Record, May 8, 1980) are: leakage, outlet works damage, slope instability, inadequate slope protection, overtopping, deterioration, and embankment deformation.

A breach analysis was made for each dam included in this plan to estimate the maximum area downstream that might be flooded if the dam should fail. Based on this, each dam has been assigned a hazard classification of "a", as shown in Table 3. Although some building symbols are shown in the flood plain, the elevations have been considered in breach inundation studies and are not affected. A site specific study should be made before developing or building anywhere within the benefited area (yellow) shown on the Project Map (Appendix D).

Breach hazard information is available from SCS. The information will also be made available to local governments having control over development. The hazard classification will be reviewed prior to construction of each dam.

Costs

Estimated costs for accelerated land treatment and structural measures are shown in Table 1. Costs for individual dams are shown in Table 2.

Construction costs are direct costs for installation of structural measures. Construction includes such items as earth embankment, excavation, reinforced concrete, reinforced concrete pipe, fish and wildlife habitat compensation measures, seeding, and fencing. Construction costs include a 12 percent contingency factor. Contingencies cover unidentified costs including cultural resources mitigation. Construction costs of the Recommended Plan are \$3,636,900.

Engineering services costs for structural measures include all direct and related costs of surveys, geologic site investigations, soil mechanics analysis, structure designs, construction plans, and construction specifications. Engineering costs of the Recommended Plan are \$508,900.

Relocation costs include all payments and services provided according to the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970. The sponsors and the Soil Conservation Service estimate that no relocations will occur.

Land rights costs are direct and related costs for the right to install, operate, and maintain works of improvement. These costs include land purchases, easements, agreements, permits, and modifications of properties and utilities. Land rights costs of the Recommended Plan are \$258,700.

Land rights cost estimates are based on current land values that vary from \$300 per acre for grassland and miscellaneous land to \$750 per acre for flood plain cropland. Land rights cost estimates may exceed actual expenses because some land rights may be donated. About 1,410 acres are needed for the floodwater retarding dams. Land values were determined by South Fork Watershed Joint District No. 76 with SCS concurrence.

Project administration costs include contract administration, review of engineering plans prepared by others, construction inspection, and relocation assistance advisory services. Project administration costs of the Recommended Plan are \$1,239,500.

Cost sharing between Public Law 566 and other sources is shown in the Agreement.

Installation and Financing

Works of improvement will be installed in a 10-year period following authorization of federal assistance under the Watershed Protection and Flood Prevention Act, Public Law 566. Estimated Table I Schedule of Obligations (page 39) shows the P.L. 566 and other costs by year. Dams 3, 6, 7, 9, 22, and 23A will be built in the first five years. Dams 2, 10, 16, 20, and 24 will be built last because of Topeka shiner considerations.

South Fork Watershed Joint District No. 76 has the necessary authority to finance and install the planned project. This includes the right to accept contributions, levy taxes, make assessments against benefited land, issue bonds, and exercise the right of eminent domain. The watershed district has agreed to use these powers as needed.

The watershed district will pay the contract administration costs it incurs.

Expenses of organizing the watershed district have been paid and current general expenses are being met by an annual ad valorem tax. Future expenses of the sponsors will be paid from funds on hand, funds to be collected through taxes, or through the issuance of general obligation bonds.

Applicable Public Law 566 funds for construction of structural measures will be provided to the local sponsoring organizations through project agreements with SCS.

Prior to signing agreements that obligate funds of SCS, the sponsors will develop a financial management system for control, accountability, and disclosure of Public Law 566 funds received, and for control and accountability for property and other assets purchased with Public Law 566 funds.

Federal technical assistance, engineering services, project administration, and funds for construction are contingent upon congressional appropriations for these purposes.

Landowners will finance and install land treatment measures that are part of the planned project (See Table 1). Cost sharing will be used as available from district, state, and/or federal programs in effect at the time of installation.

SCS, upon request, will provide technical assistance to the conservation districts for installation of land

Table I - Schedule of Obligations

<u>Year</u>	<u>Measures</u>	<u>P. L. 566 Funds</u>	<u>Other Funds</u>	<u>Total Funds</u>
1st	Land Treatment			
	Financial Assistance		54,300	54,300
	Technical Assistance	14,900		14,900
	Structural			
	Financial Assistance	687,500	43,200	730,700
	Technical Assistance	204,800	3,000	207,800
2nd	Land Treatment			
	Financial Assistance		54,400	54,400
	Technical Assistance	14,800		14,800
	Structural			
	Financial Assistance	557,800	29,800	587,600
	Technical Assistance	163,400	2,900	166,300
3rd	Land Treatment			
	Financial Assistance		54,300	54,300
	Technical Assistance	14,900		14,900
	Structural			
	Financial Assistance	403,200	28,100	431,300
	Technical Assistance	118,500	1,700	120,200
4th	Land Treatment			
	Financial Assistance		54,300	54,300
	Technical Assistance	14,800		14,800
	Structural			
	Financial Assistance	339,800	20,400	360,200
	Technical Assistance	99,800	1,600	101,400
5th	Land Treatment			
	Financial Assistance		54,400	54,400
	Technical Assistance	14,900		14,900
	Structural			
	Financial Assistance	320,000	23,900	343,900
	Technical Assistance	94,000	1,500	95,500
6th	Land Treatment			
	Financial Assistance		54,300	54,300
	Technical Assistance	14,800		14,800
	Structural			
	Financial Assistance	307,800	15,800	323,600
	Technical Assistance	90,400	1,600	92,000
7th	Land Treatment			
	Financial Assistance		54,300	54,300
	Technical Assistance	14,900		14,900
	Structural			
	Financial Assistance	476,200	28,400	504,600
	Technical Assistance	140,200	1,800	142,000
8th	Land Treatment			
	Financial Assistance		54,400	54,400
	Technical Assistance	14,800		14,800
	Structural			
	Financial Assistance	434,200	31,500	465,700
	Technical Assistance	127,800	1,700	129,500
9th	Land Treatment			
	Financial Assistance		54,300	54,300
	Technical Assistance	14,900		14,900
	Structural			
	Financial Assistance	166,400	10,800	177,200
	Technical Assistance	48,500	1,200	49,700
10th	Land Treatment			
	Financial Assistance		54,300	54,300
	Technical Assistance	14,800		14,800
	Structural			
	Financial Assistance	452,900	26,800	479,700
	Technical Assistance	133,400	1,700	135,100
TOTAL		5,515,100	820,700	6,335,800

treatment. The conservation districts set priorities for SCS technical assistance. Participation in programs to plan and install land treatment is voluntary, and landowners and operators will make final decisions on land use and practices to be installed.

SCS will follow its procedures to determine if land treatment practices will affect cultural resources. SCS will take appropriate action to identify any significant cultural resources and avoid adverse effects on them.

Installation costs of forestry land treatment and fire control measures will be borne by individual landowners, rural fire districts, and federal programs. The cost of accelerated technical forestry assistance will be borne by Public Law 566 through the Kansas State and Extension Forester cooperating with the U.S. Forest Service. Technical assistance for the fire control measures will be financed by the Kansas State and Extension Forester through the Fire Control Program.

SCS will provide technical assistance for application of fish and wildlife measures.

The Extension Service will assist with the educational phase of the land treatment program.

Land rights for all land treatment measures will be provided by landowners and operators. Administration will be shared by landowners, the watershed district, conservation districts, and SCS. Additionally, any agency offering an assistance program for land treatment will administer its own program.

South Fork Watershed Joint District No. 76 will employ a Contracting Officer and contract for construction of floodwater retarding dams. Construction contracts will be awarded on the basis of competitive bidding. Construction will begin when necessary land treatment has been installed, land rights have been obtained, Public Law 566 funds and technical assistance are available, and the necessary construction permits obtained. SCS will furnish engineering services for the floodwater retarding dams.

The watershed district will furnish needed legal services and will obtain all land rights needed for installation of floodwater retarding dams and wildlife habitat compensation areas. The watershed district will also make arrangements to abandon, move, or modify roads and utilities where necessary.

Five significant archeological sites will be avoided or protected during installation. Limited data recovery will be conducted. SCS will ensure data recovery plans are carried out. Data recovery costs will be borne by SCS.

If potentially significant cultural resources are discovered during construction, appropriate notice will be given to the Secretary of the Interior (through Departmental Consulting Archeologist) in accordance with Section 3 of Public Law 93-291 (AHPA). SCS will take action to protect or recover, or both, any significant cultural resources discovered during construction.

Operation and Maintenance

Land treatment measures will be maintained by owners and operators of farms on which the measures are installed. Conservation district representatives will periodically inspect land treatment measures and will encourage landowners to perform needed maintenance, to replace obsolete measures, and to help plan and install new measures necessary to maintain adequate protection.

Technical assistance to landowners and rural fire districts for operating and maintaining forestry and fire control measures will be provided by the Kansas State and Extension Forester in cooperation with the Forest Service.

An agreement calling for the watershed district to operate and maintain each floodwater retarding dam and its related wildlife habitat and other vegetative measures will be signed with SCS before relocation payments or construction of each dam begins. These agreements will conform to the Soil Conservation Service's National Operation and Maintenance Manual, and will include provisions for retention, use, and disposal of property acquired or improved with Public Law 566 assistance. Maintenance expected rather frequently includes repairs to fences, selective tree cutting and planting, restricted grazing or burning and clearing of debris around trash racks. Repairs to major items such as dams and spillways are expected infrequently. SCS will provide technical assistance. Estimated average annual operation and maintenance costs for the dams are \$17,100.

South Fork Watershed Joint District No. 76 will be responsible for maintaining drawdown control valves and passing natural streamflow through all dams to meet

downstream water rights as provided by the Kansas Water Appropriation Act. The watershed district will make releases necessary for pool drainage for operation and maintenance.

Operation and maintenance of wildlife areas will be in accordance with a wildlife habitat management plan developed by the sponsors and landowners in cooperation with SCS.

Each dam will be jointly inspected by SCS and the sponsors immediately after initial filling. Special inspections will be made during or immediately following the occurrence of major events such as floods or earthquakes. The inspection team is to: review hazard classification, assess operation and maintenance adequacy, identify unsafe conditions, and specify work needed.

An Operation and Maintenance Plan will be developed for each dam. It will address items of inspection including, but not be limited to, the principal spillway and its appurtenances, emergency spillway, dam, vegetation on the dam and emergency spillway, fences installed as part of the project, and wildlife habitat measures. The watershed district will provide access for inspections of the dams and will keep records of the inspections.

Access to floodwater retarding dams, other than for operation and maintenance, will be controlled by landowners. The watershed district will notify landowners and the Kansas Department of Health and Environment (KHE) of the need for sanitary facilities if significant recreational use occurs. The KDHE will provide technical assistance to the watershed district to recognize and to solve any problems that may develop with disease vectors.

The State Historical Society will be notified of periodic inspections of Dam No. 23A. As needed they may accompany the inspection team for the purpose of monitoring archeological sites 14BU350, 14BU356, and 14BU357.

TABLE 1 - ESTIMATED INSTALLATION COST
South Fork Watershed, Kansas

Installation Cost Item	Unit	Number	Estimated Cost (Dollars) ^{a/}						TOTAL
			P. L. 566			Other			
			SCS ^{b/}	FS ^{b/}	Total	SCS ^{b/}	FS ^{b/}	Total	
<u>LAND TREATMENT - ACCELERATED</u>									
Rangeland Improvement	acres	31,245				31,200		31,200	31,200
Proper Grazing Use	acres	31,245				78,100		78,100	78,100
Planned Grazing Systems	acres	2,000				30,000		30,000	30,000
Brush Management	acres	60				240,000		240,000	240,000
Ponds	no.					90,000		90,000	90,000
Range Seeding	acres	1,200							
Wildlife Upland Habitat Management	acres	250				28,000		28,000	28,000
Forest Management	acres	500					13,500	13,500	13,500
Fire Control	acres	162,800					32,500	32,500	32,500
Technical Assistance			148,500		148,500				148,500
TOTAL LAND TREATMENT			148,500		148,500	497,300	46,000	543,300	691,800
<u>STRUCTURAL MEASURES</u>									
Floodwater Retarding Dams	no.	11	5,366,600		5,366,600	277,400		277,400	5,644,000
TOTAL PROJECT			5,515,100	- 0 -	5,515,100	774,700	46,000	820,700	6,335,800

a/ Price Base 1982

b/ Federal agency responsible for assistance in installation of works of improvement

July 1984

TABLE 2 - ESTIMATED COST DISTRIBUTION
STRUCTURAL MEASURES

South Fork Waterhed, Kansas

(Dollars)^{a/}

Item	Installation Cost P.L. 566 Funds				Installation Cost - Other Funds			Total Cost
	Construction	Engineering	Project Admin.	Total P. L. 566	Land Rights	Project Admin.	Total Other	
STRUCTURAL MEASURES								
Floodwater Retarding Dams								
2	270,000	37,800	90,400	398,200	15,800	1,600	17,400	415,600
3	160,600	22,500	53,300	236,400	9,600	1,300	10,900	247,300
6	298,100	41,700	99,800	439,600	20,400	1,600	22,000	461,600
7	353,700	49,500	118,500	521,700	28,100	1,700	29,800	551,500
9	280,700	39,300	94,000	414,000	23,900	1,500	25,400	439,400
10	397,300	55,600	133,400	586,300	26,800 ^{b/}	1,700	28,500	614,800
16	146,000	20,400	48,500	214,900	10,800	1,200	12,000	226,900
20	417,700	58,500	140,200	616,400	28,400	1,800	30,200	646,600
22	328,700	46,000	110,100	484,800	20,200	1,600	21,800	506,600
23A	603,200	84,300	204,800	892,300	43,200	3,000	46,200	938,500
24	380,900	53,300	127,800	562,000	31,500	1,700	33,200	595,200
GRAND TOTAL	3,636,900	508,900	1,220,800	5,366,600	258,700	18,700	277,400	5,644,000

a/ Price Base 1982

b/ Includes \$600 for road modification

November 1983

TABLE 3 - STRUCTURAL DATA
DAMS WITH PLANNED STORAGE CAPACITY

South Fork Watershed, Kansas

ITEM	UNIT	DAM NUMBER							
		2	3	6	7	9	10	16	
Hazard Class		a	a	a	a	a	a	a	
Seismic Zone		2	2	2	2	2	2	2	
Drainage Area	Sq. Mi.	4.56	2.08	5.90	9.24	8.11	8.17	2.74	
Runoff Curve No. (1-day)(AMC II)		76	75	76	77	75	76	76	
Time of Concentration (T _C)	Hrs.	1.1	1.0	1.6	2.5	2.0	1.9	1.1	
Elevation Top of Dam	Ft.	1,339.0	1,372.1	1,333.0	1,349.6	1,315.8	1,381.0	1,418.6	
Elevation Crest Emergency Spillway	Ft.	1,334.0	1,367.1	1,327.4	1,343.0	1,309.4	1,375.0	1,413.6	
Elevation Crest Inlet	Ft.	1,316.0	1,355.2	1,308.2	1,321.2	1,289.8	1,354.2	1,399.2	
Maximum Height of Dam	Ft.	44	29	43	49	43	47	34	
Volume of Fill	Cu. Yds.	184,600	76,200	150,800	202,500	172,000	236,600	75,200	
Total Capacity ^{a/}	Ac. Ft.	939	390	1,243	1,976	1,622	1,695	547	
Sediment Submerged	Ac. Ft.	97	52	123	177	143	166	69	
Sediment Aerated	Ac. Ft.	12	6	12	20	17	17	7	
Floodwater Retarding	Ac. Ft.	830	332	1,108	1,779	1,462	1,512	471	
Surface Area									
Sediment Pool	Acres	19	13	28	29	28	30	17	
Floodwater Retarding Pool ^{a/}	Acres	82	48	104	152	133	128	53	
Principal Spillway Design									
Rainfall Volume (1-day)	In.	6.60	6.20	6.60	6.60	6.60	6.60	6.20	
Rainfall Volume (10-day)	In.	10.60	10.00	10.60	10.60	10.90	10.90	10.20	
Runoff Volume (10-day)	In.	5.32	4.66	5.32	5.51	5.38	5.57	4.99	
Capacity (Max.)	c.f.s.	71	30	66	125	118	123	32	
Dimensions of Conduit	In.	24	18	24	30	30	30	18	
Emergency Spillway - Frequency Operation	% Chance	3	4	3	3	3	3	4	
Emergency Spillway Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	
Emergency Spillway Bottom Width	Ft.	150	40	150	150	150	200	40	
Emergency Spillway Exit Slope	%	4	4	4	4	2.7	4	4	
Emergency Spillway Hydrograph									
Rainfall Volume	In.	7.20	5.90	7.19	7.19	7.20	7.19	5.90	
Runoff Volume	In.	4.44	3.20	4.43	4.54	4.33	4.44	3.29	
Storm Duration	Hrs.	6	6	6	6	6	6	6	
Velocity of Flow (V) ^{b/}	Ft./Sec.	5.2	1.5	4.9	5.1	4.5	5.1	5/	
Max. Reservoir Water Surface Elevation	Ft.	1,336.0	1,367.3	1,329.1	1,344.9	1,311.4	1,376.9	1,376.9	
Freeboard Hydrograph									
Rainfall Volume	In.	11.40	8.50	11.49	11.49	11.50	11.49	8.50	
Runoff Volume	In.	8.33	5.50	8.41	8.55	8.28	8.42	5.61	
Storm Duration	Hrs.	6	6	6	6	6	6	6	
Max. Reservoir Water Surface Elevation	Ft./Sec.	1,339.0	1,370.3	1,332.9	1,349.6	1,315.8	1,381.0	1,417.3	
Discharge Per Foot of Width (Q _e /b)	Ac. Ft.	7.2	5.1	9.3	14.4	12.0	10.0	7.0	
Bulk Length	Ft.	600	400	300	300	600	400	300	
Capacity Equivalents									
Sediment Volume	In.	0.45	0.52	0.43	0.40	0.37	0.42	0.52	
Floodwater Retarding Volume	In.	3.41	2.99	3.52	3.61	3.38	3.47	3.22	

a/ Crest of emergency spillway

b/ Maximum during passage of hydrograph

c/ Emergency spillway hydrograph is contained below crest of emergency spillway

November 1983

TABLE 3 - STRUCTURAL DATA
DAMS WITH PLANNED STORAGE CAPACITY
South Fork Watershed, Kansas

ITEM	UNIT	DAM NUMBER				TOTAL
		20	22	23A	24	
Hazard Class		a	a	a	a	xxx
Seismic Zone		2	2	2	2	xxx
Drainage Area	Sq. Mi.	8.06	6.40	13.67	8.77	77.70
Runoff Curve No. (1-day)(AMC II)		77	76	77	76	xxx
Time of Concentration (T _c)	Hrs.	1.9	1.5	2.3	2.2	xxx
Elevation Top of Dam	Ft.	1,465.2	1,410.6	1,415.5	1,456.3	xxx
Elevation Crest Emergency Spillway	Ft.	1,459.0	1,405.2	1,406.9	1,450.7	xxx
Elevation Crest Inlet	Ft.	1,440.6	1,385.0	1,384.5	1,432.0	xxx
Maximum Height of Dam	Ft.	45	44	48	42	xxx
Volume of Fill	Cu. Yds.	211,900	140,300	286,100	196,500	1,932,700
Total Capacity ^{a/}	Ac. Ft.	1,745	1,311	3,018	1,862	16,348
Sediment Submerged	Ac. Ft.	189	126	233	168	1,543
Sediment Aerated	Ac. Ft.	22	14	29	19	175
Floodwater Retarding	Ac. Ft.	1,534	1,171	2,756	1,675	14,630
Surface Area						
Sediment Pool	Acres	33	24	45	35	301
Floodwater Retarding Pool ^{a/}	Acres	148	104	215	156	1,323
Principal Spillway Design						
Rainfall Volume (1-day)	In.	6.60	6.70	6.66	6.60	xxx
Rainfall Volume (10-day)	In.	11.00	11.00	10.98	11.10	xxx
Runoff Volume (10-day)	In.	5.84	5.65	5.81	5.73	xxx
Capacity (Max.)	c.f.s.	122	119	178	118	xxx
Dimensions of Conduit	In.	30	30	36	30	xxx
Emergency Spillway - Frequency Operation	% Chance	3	3	3	3	xxx
Emergency Spillway Type		Veg.	Veg.	Rock	Veg.	xxx
Emergency Spillway Bottom Width	Ft.	150	200	40	200	xxx
Emergency Spillway Exit Slope	%	4	4	10	4	xxx
Emergency Spillway Hydrograph						
Rainfall Volume	In.	7.30	7.20	7.12	7.25	xxx
Runoff Volume	In.	4.64	4.44	4.49	4.48	xxx
Storm Duration	Hrs.	6	6	6	6	xxx
Velocity of Flow (V _e) ^{b/}	Ft./Sec.	5.3	5.1	4.6	4.7	xxx
Max. Reservoir Water Surface Elevation	Ft.	1,461.0	1,407.1	1,408.4	1,452.3	xxx
Freeboard Hydrograph						
Rainfall Volume	In.	11.62	11.50	11.43	11.50	xxx
Runoff Volume	In.	8.67	8.42	8.47	8.42	xxx
Storm Duration	Hrs.	6	6	6	6	xxx
Max. Reservoir Water Surface Elevation	Ft./Sec.	1,465.2	1,410.5	1,415.5	1,456.3	xxx
Discharge Per Foot of Width (Q _e /b)	Ac. Ft.	13.0	8.0	65.0	10.0	xxx
Bulk Length	Ft.	500	600	500	400	xxx
Capacity Equivalents						
Sediment Volume	In.	0.49	0.41	0.36	0.40	xxx
Floodwater Retarding Volume	In.	3.57	3.43	3.78	3.58	xxx

a/ Crest of emergency spillway
b/ Maximum during passage of hydrograph
c/ Emergency spillway hydrograph is contained below crest of emergency spillway

TABLE 4 - ANNUALIZED ADVERSE NED EFFECTS

South Fork Watershed, Kansas

(Dollars)a/

EVALUATION UNIT	PROJECT OUTLAYS <u>b/</u>		TOTAL
	Amortization of Installation Cost	Operation and Maintenance Cost	
Floodwater Retarding Dams Nos. 6, 7, 9, 10, 16, 20, 22, 23A, and 24	275,200	10,400	285,600
Floodwater Retarding Dam No. 2	20,800	900	21,700
Floodwater Retarding Dam No. 3	15,500	600	16,100
Accelerated Land Treatment	36,800	26,300	63,100
TOTAL	348,300	38,200	386,500

a/ Price Base 1982; all costs discounted to the beginning of the installation period and annualized at 7 7/8 interest rate for the period of analysis

b/ See Appendix C, Table IV, for undiscounted annual costs

January 1984

TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE
REDUCTION BENEFITS

South Fork Watershed, Kansas

(Dollars)^{a/}

Item	Estimated Average Annual Damage		Damage Reduction Benefits Within the Watershed
	Without Project	With Project	Structural Measures
Floodwater			
Crop and Pasture	491,900	211,000	280,900
Other Agricultural	70,300	25,600	44,700
Non-agricultural			
Road and Bridge	9,000	4,500	4,500
Subtotal	571,200	241,100	330,100
Erosion			
Flood Plain Scour	109,500	59,900	49,600
Subtotal	680,700	301,000	379,700

Item	Estimated Average Annual Damage		Damage Reduction Benefits to Cottonwood River Properties Outside the Watershed
	Without Project	With Project	Structural Measures
Floodwater			
Crop and Pasture	1,957,000	1,846,700	110,300
Other Agricultural	97,700	91,800	5,900
Non-agricultural			
Road and Bridge	321,400	303,800	17,600
Railroad	163,400	150,200	13,200
Subtotal	2,539,500	2,392,500	147,000

GRAND TOTAL	3,220,200	2,693,500	526,700
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^{a/} Price Base: Agricultural production is current normalized (October 1982), all other is current 1982.

November 1983

TABLE 6 - COMPARISON OF NED BENEFITS AND COSTS
South Fork Watershed, Kansas

a/
(Dollars)

Evaluation Unit	Damage Reduction Benefits	Intensification Benefits	Flood Damage Reduction Benefits Outside Watershed	Total Benefits c/	Total Costs b/	Benefit Cost Ratio
Floodwater Retarding Dams Nos. 6, 7, 9, 10, 16, 20, 22, 23A, and 24	240,000	30,800	95,000	365,800	285,600	1.3:1
Floodwater Retarding Dam No. 2	16,000	3,900	5,500	25,400	21,700	1.2:1
Floodwater Retarding Dam No. 3	12,200	2,000	3,200	17,400	16,100	1.1:1
Accelerated Land Treatment	0	137,400	0	137,400	63,100	2.2:1
TOTAL	268,200	174,100	103,700	546,000	386,500	1.4:1

a/ Price Base 1982. All benefits discounted to the beginning of the installation period and annualized at 7 7/8 interest rate for the period of analysis.

b/ From Table 4

c/ See Appendix C, Table V, for undiscounted annual benefits

January 1984

IMPACTS OF RECOMMENDED PLAN

This section covers the impacts of the recommended plan on each of the problems determined by the interdisciplinary team as significant during "scoping." Impacts are measured in physical and monetary terms if at all possible.

A review of the analysis of impacts, Table A on page 13 shows that the recommended plan will have a major impact on flooding, streamflow, and agricultural income. It will have a moderate impact on erosion, sedimentation, land use, prime farmland, fish and wildlife, a state-listed threatened species, transportation, and fire protection. The recommended plan will have minor or no impacts on drainage, mineral resources, stream classification, water supply, ground water, irrigation, water and air quality, visual and cultural resources, disease vectors, recreation, federally-listed endangered, threatened species, minority populations, and relocations. These factors with minor or no impact were not significant to decisionmaking and will not be discussed further. Rationale for not discussing a factor in this section was given in the Significant Concerns section.

Flooding Related Impacts

Installation of 11 floodwater retarding dams will have a major impact on streamflow in the watershed. Frequency, discharge, depth, area, and velocity of flood flows will be reduced.

Table J shows reduction of peak discharges with the project and the frequency of bankfull flows with and without the project:

Table J - Peak Reductions and Bank Full Frequencies

<u>Reach</u>	<u>b/ Location</u>	<u>Percent a/ Peak Reduction</u>	<u>Bank full frequency</u>	
			<u>w/o Project</u> Times(s)/ Year(s)	<u>w/Project</u> Time(s)/ Year(s)
1	Bloody Creek Section 30-19-9E	26.4	1/1	2/3
3	Near Cottonwood Falls	31.0	1/1	1/2
5	South Fork Outlet	36.2	3/1	3/2
7	Near Bazaar	37.3	1/1	1/2
8	Section 31-20-8E	40.4	1/2	1/10
9	Section 6-21-8E	48.1	1/1	2/3
10	Section 10-21-8E	61.9	2/1	1/3
11	Section 5-21-8E	39.3	2/1	2/3
12	Section 19-21-8E	39.9	3/2	1/2
13	North of Matfield Green	43.5	3/1	4/3
14	Section 7-21-8E	22.1	4/3	4/5
16	Section 9-21-8E	38.4	1/1	1/25
17	Section 17-21-8E	58.7	1/1	1/7
19	Section 28-21-8E	38.6	2/1	4/5

a/ Average reductions for storms ranging from 4 inches to 10 inches of rainfall in 24 hours.

b/ Reaches 2, 18, and 20 are located above the evaluated flood plain. No detailed information is available for these reaches.

The planned project will accomplish a 56 percent reduction in average annual flood damage on 8,445 acres. Flood plain benefited in each reach and the percentage of damage reduction from the structural measures is shown in Table K.

Table K - Average Annual Flood Damage Reduction

<u>Evaluation Reach b/</u>	<u>Flood Plain a/ Benefited (acres)</u>	<u>Damage Reduction (percent)</u>
1	654	39
3	288	66
5	1,974	43
7	904	60
8	512	53
10	457	84
11	830	59
12	801	57
13	636	53
14	124	33
16	363	90
17	583	80
19	319	60
Total	8,445	56

a/ 100-year flood plain, excluding channels

b/ Reaches 2, 9, 18, and 20 were evaluated as tributary reaches. Cross sectional areas were not defined or depth area relationships developed. The tributary reaches were analyzed by interpolation of selected reaches immediately below them. These tributary reaches were not included in the total of flood plain acres during the planning process and are therefore not shown as benefited flood plain in Table K. The percent damage reduction for these tributary reaches are 83, 76, 78, and 20 respectively.

Extremes in streamflow will be reduced. The dams will reduce high-flow peaks while prolonging discharge after storms. Some water will evaporate from impoundments. Water stored in dams will increase groundwater recharge in some of the limestone formations. The effect on groundwater tables is not expected to be of widespread significance; however, the recharge will increase flow from springs in the vicinity of the dams. Seepage and prolonged discharge from reservoirs will contribute to stream base flows. Overall, the discharge and frequency of low flows is expected to increase. Streams will be dry less often although changes of stream classification are not expected. 39/

Flood plain residents will have improved living conditions and economic and psychological security from reduced

flooding. Flood damage reduction will indirectly affect most of the 1,800 people in the watershed. All or parts of 102 farm operating units are located in the flood plain and will be directly affected by the project. The project will benefit 7,214 acres of flood plain cropland. Farm owners and operators should realize a significant increase in income.

The total annual project benefits for the watershed are estimated to be \$782,500 (including \$203,700 due to accelerated land treatment measures).

Total annual flood damage reduction benefits within the watershed are estimated to be \$379,700. Off-project benefits are estimated to be \$147,000. See Tables 5 and 6 for individual benefit items.

Intensification benefits will stem from a shift from flood-resistant, lower income crops to higher income crops no longer flooded or flooded less frequently once the project is completed.

Damages to roads and bridges both in the watershed and along the Cottonwood River will be reduced. Less frequent flooding and lower flood peaks will help reduce maintenance and replacement costs.

Damage reduction benefits to Cottonwood River properties outside the watershed will be approximately 28 percent of the total benefits for the South Fork Watershed project. Each planned or potential project in the Cottonwood Basin was allocated a share of the total potential benefits identified along the Cottonwood River flood plain. Benefit distribution was based on analysis of simulated localized historical storms centered over various parts of the basin. The benefit distribution study was coordinated with the U.S. Corps of Engineers, who was studying potential small watershed structures elsewhere in the basin (see Relationship to Land and Water Resource Plans, Policies, and Controls). Benefits of completed projects such as Silver Creek Watershed and Marion Reservoir were not factors in the benefit analysis because the "without project" conditions included their effects.

Erosion Related Impacts

Installation of the recommended structural measures will have a significant impact on the flood plain soil loss. Excessive erosion will be reduced to an acceptable loss rate on 1,980 acres which is 84 percent of the total flood plain

scour area. The recommended project will have little impact on the upland soil loss. A 5.2 percent reduction in soil loss is expected. The EQ measures of wildlife upland habitat management and rangeland improvement will add to the ground cover, slowing runoff and improving water intake by soils.

The forest land treatment program will reduce erosion. Woodlands with vigorous, fully stocked stands of trees and undisturbed ground cover will slow runoff and improve water intake by soils. Windbreaks and shelterbelts will break up wind and assist in reducing erosion and improving the quality of the environment. Increased fire prevention will reduce wildfires that destroy ground cover and expose soil to wind and water erosion.

Land Use and Prime Farmland Impacts

Table L shows land use in the future with project conditions. Except for land used for dams and wildlife areas, land use will remain about as shown in Table C, page 14.

Table L - Projected Land Use With Project

	<u>Total Percent</u>	<u>Watershed Acres</u>
Cropland	9.1	16,671
Native Pasture	1.4	2,700
Pastureland	1.5	2,797
Rangeland	85.0	156,955
Wildlife Land	0.5	893
Woodland	0.8	1,569
Transportation Services	0.5	860
Farmsteads and Residential Land	0.6	1,043
Other (Water)	<u>0.6</u>	<u>1,062</u>
Total	100.0	184,550

Sediment pool land uses will be changed initially to water surface and eventually sediment. The dam and spillway acres will be seeded to native grasses and forbs and managed for wildlife. The 11 planned dams will directly change land cover as shown in Table M. Two hundred fifty acres of Native Pasture and 6 ponds installed in the land treatment program will be managed as Wildlife Land. The storage pools of the 60 land treatment ponds will change the Rangeland to water area.

Table M - Land Cover at Dams (acres)

<u>Project Land Use</u>	<u>Present Land Cover</u>				<u>Total</u>
	<u>Crop- land</u>	<u>Grass- land*</u>	<u>Forest- land</u>	<u>Other</u>	
Dams and Spillways	13	51	11		75
Sediment Pools	31	166	85	19	301
Flood Detention Pools	58	786	161	17	1,022
Total	102	1,003	257	36	1,398

*All rangeland

At maximum design capacity 1,022 acres will be temporarily covered by flood pools. Individual flood pools will be filled an average of once every 25 years or less frequently.

Reduced flooding on 1,432 acres will result in their being classed as prime farmland. Structures will occupy 230 acres of existing prime farmland. A net increase of 1,202 acres of prime farmland will result. Additionally, 6,276 acres of existing prime farmland will benefit from reduced flooding.

Fish and Wildlife Impacts

Sponsors will compensate all woodland wildlife habitat losses caused by dams and reservoirs. Wildlife habitat changes induced by project measures are summarized in Table N and shown in detail Table II, Appendix C. Table I, Appendix C, shows expected terrestrial habitat changes that would have occurred without compensation.

Table N - Impact on Wildlife Habitat at Dams 24/

<u>Habitat Type</u>	<u>Construction</u>	<u>Habitat Value a/</u>	<u>Net Change</u>
		<u>Compensation</u>	
Woodland	- 653.7	+ 653.7	0
Herbaceous	-1,347.7	+ 750.0	- 597.7 b/

a/ Value listed in habitat units. Habitat units equal rated quality value (1 to 10) multiplied by acres.

b/ The interdisciplinary team recommended only partial compensation because of the abundance of herbaceous habitat within the project area.^{42/}

Wildlife habitat diversity in woodland areas will improve with proper grazing management and related increase of woodland understory. Restricted use of woodland for winter feeding areas for livestock will promote increased growth in the woodland understory and grass. Wildlife habitat management of 250 acres of native pastureland will result in an increase of 750 habitat units.

Management of rangeland to obtain a good or better condition benefits wildlife as well as livestock. The diversity of grasses and forbs is greatest on good condition range which improves the habitat for wildlife. The use of specialized grazing systems or the use of frequent late season rest along with proper use can restore and maintain the rangeland in good condition. Rangeland improvement will result in an increase of 135,807 habitat units for upland wildlife. Six of the 60 ponds installed in the land treatment program will be fenced and managed for wildlife. Each of these ponds will provide an average of 2 acres of land for wildlife. Each of the 60 ponds will provide 1 acre of surface water for wildlife use. There will be a total increase of 30 habitat units for upland wildlife and 384 habitat units for aquatic life.

Threatened or Endangered Species Impacts

There are no known nationally listed threatened or endangered species that are permanent residents within the watershed. Migrant species that may occur within the watershed are the bald eagle and whooping crane. The project will have no impact on these species.29/

The only state-listed threatened or endangered species that occurs within South Fork Watershed is the Topeka shiner (Notropis topeka). Adverse impacts on the species will be minimized through mitigation necessary to secure a permit from the Kansas Fish and Game Commission.

Cultural Resources

No cultural resources listed in the National Register of Historic Places will be affected by the project.43/ Three prehistoric archeological sites contributing to a district considered eligible for the Register will be affected.45/ Adequate data recovery will be conducted to mitigate the effects on two of three sites. Impacts on the third site will be avoided by controlling construction use of the site area.

Potential impacts of land treatment measures on cultural resources will be determined during installation following SCS procedures.

Other Impacts

The rangeland improvement measure will increase livestock forage production. These accelerated land treatment measures will bring rangeland presently in poor or fair condition up to a good condition.

The forest management measure will provide for the harvesting of mature and over mature trees in those areas that presently have inadequate seedling and sapling age trees. The purpose is to regenerate these stands with natural reproduction of commercially valuable species. There have been 300 acres of harvestable timber identified with a potential \$75 to \$150 net economic return per acre to cooperating landowners. Reinforcement plantings are planned on 200 acres. The plantings will be made in areas of timber losses due to logging or disease. The work will require hand planting on the average of 100 to 200 seedlings per acre at an average cost of \$50 per acre.

Fire control will be provided on 162,800 acres of grassland through the continuing efforts of organized fire districts which cover the total watershed. Fire control needs addressed are (1) procurement and proper placement of improved fire control equipment, (2) training of fire district volunteers, (3) development of fire prevention programs, (4) scheduling and coordination of range burning, and (5) strengthening and cooperative agreements between fire districts.

The project will convert 10.7 miles of high quality and unique streams to permanent water (1.5 perennial, 8.4 intermittent, 0.8 ephemeral). This will improve downstream water quality by the impoundment of sediment, other solids and adsorbed chemicals. Additionally, this will reduce the effects of slug concentrations of nutrients, bacteria, sediment and suspended solids during floods. Biological oxygen demand and bacterial densities will be decreased. Water temperatures will not be significantly changed.

Storm runoff will increase concentrations of suspended sediment, nutrients, bacteria, biocides, and other suspended particles in reservoirs. Most of these materials will settle within one week. Degradation of water quality due to herbicide use in brush management is not anticipated.

Because of the small size of the planned reservoirs compared to the large areas suitable for oil wells and rock quarries, the reservoirs will not affect mineral extraction.

There will be no gas wells, oil wells, or pipelines that will be affected by the reservoirs.

Use of sediment pools for recreation will not be competitive with recreation projects in the area. Some use by local residents for fishing is expected but will not be of major impact.

Mosquito breeding areas will be decreased because less flood plain area will be flooded.

There is no effect anticipated on any existing wetlands due to project actions.

Relationship to Land and Water Resource Plans, Policies and Controls

Nearby projects of other agencies include Chase State Fishing Lake 2 miles west of Cottonwood Falls and three Corps of Engineers projects: Council Grove Reservoir in Morris County, John Redmond Reservoir located 30 miles east of the watershed, and Milford Reservoir located 60 miles north. Marion Reservoir, upstream, also affects the common flood plain of all the Cottonwood basin watersheds.

Other projects in the Cottonwood River basin include: Diamond Creek and Middle Creek Watersheds (planning completed); Peyton Creek Watershed (approved for construction); Eagle Creek, Jacob Creek, and Phenix Creek Flood Prevention RC&D Measures (approved for construction); Silver Creek Watershed (construction completed); and Doyle Creek Watershed (application approved). Rock Creek (application approved), and Allen Creek (application approved) are Neosho River tributaries above John Redmond Reservoir.

In December 1979 the Corps of Engineers, Tulsa District, published a report 30/ providing information on potential locations for small dams in the Grand and Cottonwood River watersheds above John Redmond Reservoir. These sites were studied for future use in the formulation of alternative plans for water resource development in the basin area. Middle Creek, Diamond Creek, Peyton Creek, Silver Creek, Eagle Creek, and South Fork Watersheds were not included in the Corps' study.

Consideration was taken to comply with applicable federal policies during planning. The following table shows the effects of the recommended plan on particular resources that are recognized by certain federal policies.

Table 0 - Effects of the Recommended Plan on Resources of Principal National Recognition

Types of Resources	Principal Sources of National Recognition	Measurement of Effects
Air quality	Clean Air Act, as amended (42 U.S.C. 1857h-7 et seq.)	No effect
Areas of particular concern within the coastal zone . . .	Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1451 et seq.)	Not present in planning area
Endangered and threatened species critical habitat . .	Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)	No effect
Fish and wildlife habitat . . .	Fish and Wildlife Coordination Act (16 U.S.C. Sec. 661 et seq.)	See Table 1, Appendix C
Flood plains	Executive Order 11988, Flood Plain Management	2,216 acres less area flooded
Historic and cultural properties	National Historic Preservation Act of 1966, as amended (16 U.S.C. Sec. 470 et seq.)	7 significant sites identified. Project will have no adverse effect.
Prime and unique farmland . . .	CEQ Memorandum of August 1, 1980: Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing the National Environmental Policy Act.	1,202 acres gain
Water quality	Clean Water Act of 1977 (33 U.S.C. 1251 et seq.)	No effect
Wetlands	Executive Order 11990, Protection of Wetlands Clean Water Act of 1977. (42 U.S.C. 1857h-7, et seq.)	225 acres (Type 5) gain
Wild and scenic rivers	Wild and Scenic Rivers Act, as amended (16 U.S.C. 1271 et seq.)	No effect

CONSULTATION AND PUBLIC PARTICIPATION

The first meeting of the South Fork watershed group was a public meeting sponsored by the Chase County Conservation District at the Matfield Green grade school on March 15, 1961. On June 15, 1961, a steering committee was elected. A feasibility study was conducted and released to the steering committee by the Soil Conservation Service March 27, 1962. The steering committee was inactive until June 9, 1965.

Further feasibility studies were made in September, 1965. Watershed district boundaries were set with the help of the Division of Water Resources and petitions were circulated in the fall and winter of 1966-67. The petitions were found sufficient by the Secretary of State on April 24, 1967, and by the Chief Engineer on May 26, 1967, to organize a district.

The South Fork Watershed District was organized according to Kansas State Statutes of incorporation on August 11, 1967. South Fork Watershed Joint District No. 76 and other sponsors, Chase County Conservation District, Butler County Conservation District, and Greenwood County Conservation District, submitted a watershed application to the Soil Conservation Service on January 22, 1968. This application was filed with the Governor's Watershed Review Committee later in 1968.

A field examination and public meeting were conducted April 17, 1968. The field examination team was composed of representatives from the State Conservation Commission; Kansas Water Resources Board; Kansas State Board of Agriculture, Division of Water Resources; U.S.D.A., Soil Conservation Service; U.S.D.A., Forest Service; and Kansas Extension Service. A Field Examination Report was prepared summarizing the team's findings and recommendations.^{21/} The State approved the watershed application on May 23, 1968. A priority for planning was assigned by the Kansas Watershed Review Committee.

Initial planning results were presented to sponsors in a Preliminary Watershed Investigation Report dated October 1970. The Soil Conservation Service approved planning assistance on November 1, 1971.

On November 30, 1971, after a series of meetings and solicitation of public input, the sponsors formulated a tentative system of structural measures for their General

Plan. The Waterhed District asked the Soil Conservation Service to determine those dams that would be eligible for PL-566 financial assistance. Twenty-six were estimated feasible for PL-566 assistance and incorporated into the General Plan. The Cottonwood-Neosho River Watershed Committee was formed in September of 1975 to support watershed development at state and national government levels.

An interagency interdisciplinary team consisting of representatives from the Kansas Fish and Game Commission; U. S. Fish and Wildlife Service; Kansas State Conservation Commission; KSU Extension Service; and Soil Conservation Service met in Salina in October 1978. Their purpose was to identify preliminary project objectives and review the adequacy of the environmental assessment. At this meeting the sponsors' objectives were broadened to include other national, environmental, and special interest group objectives. Areas where further study and assessment were needed were identified and individual responsibility assigned. An impact analysis of proposed project alternatives was completed before presenting plans to the sponsors.

A public meeting was held on December 7, 1978, to discuss the environmental assessment, national economic and environmental objectives, national economic development plan, environmental quality plan; and to answer questions and solicit ideas from the public. After the meeting the public was further invited to help formulate a plan.

See the Project Formulation section for more information about the planning process.

Since formal incorporation of the South Fork Watershed Joint District No. 76, the district board has carried out a continuing program to inform and involve the general public. Some activities of this program are listed below:

1. Quarterly or on-call meetings open to the public have been held. Specialists have usually been available to discuss watershed problems and planning needs.
2. Annual meetings, advertised in advance in the principal county newspapers, have been held.
3. Meetings have been held as necessary between watershed board representatives and officials of city, townships, county and state governments, and other sponsors.

4. Frequent personal contacts have been made between watershed directors and individual farmers to explain the program.

Conservation districts have an active role as sponsors of the proposed watershed program. News media, business people, and others are backing the project. Residents and landowners in the watershed have had substantial opportunity to participate in formulating project objectives and alternative actions.

A team of biologists investigated proposed dam sites in the watershed to evaluate wildlife habitat and estimate changes.^{32/} One interdisciplinary team developed an environmental quality plan and another team reviewed the habitat changes and recommended full compensation for woody habitat losses to the State Conservationist.^{24/} The Soil Conservation Service and sponsors worked together to determine the maximum habitat replacement consistent with sponsor capabilities to provide land rights, operation and maintenance. The watershed district board adopted a policy of total compensation for woodland wildlife habitat changes resulting from project construction, as well as management of herbaceous vegetation on the dam and spillway for wildlife habitat.

A Forestry Work Plan^{12/} was developed by the State and Extension Forester, Kansas State University, and the Forest Service, and its features were included in the recommended plan.

Consultation concerning the listing of the South Fork of the Cottonwood River on the National Rivers Inventory was initiated September 28, 1982, with the Midwest Region of the National Park Service.^{19/}

The Kansas State Historical Society surveyed archeological, architectural, and historical resources in the watershed and the impact of the proposed project on these resources^{14/15/16/44/} was determined in consultation with the State Historic Preservation Officer.^{45/}

A public meeting was held on May 31, 1983, to discuss the draft plan and environmental impact statement. A question and answer session was part of the meeting.

The following agencies, conservation groups, and organizations were asked to comment on the draft plan and environmental impact statement:

Department of the Army	Federal Energy Regulatory
Department of Commerce	Commission
Department of Health	Friends of the Earth
and Human Services	Governor of Kansas
Department of Housing	Kansas State Historical Society
and Urban Development	Kansas Water Office
Department of the Interior	National Audubon Society
Department of Transportation	National Wildlife Federation
Division of Budget (State	Natural Resources Defense
Clearinghouse)	Council
Environmental Defense Fund	National Park Service
Environmental Protection Agency	Office of Minority Affairs
	USDA

See Appendix A for letters of comment received.

Comments received from the following agencies either provided concurrence or did not raise environmental issues: Department of Housing and Urban Development, Governor of Kansas, Forest Service, and Office of Equal Opportunity.

Each environmental issue, problem, or objection raised during interagency review is presented and discussed in Appendix A.

LIST OF PREPARERS

SOUTH FORK WATERSHED
WORK PLAN AND ENVIRONMENTAL IMPACT STATEMENT

FORMAT:

NAME - Present Job Title (years); Degree(s) - Major; continuing education subjects; Former Job Titles (years of experience); other information.

INTERDISCIPLINARY TEAM:

LARRY BROWN - SCS Asst. State Soil Scientist (3); BS - Soil Conservation, MS - Soil Science, Soil Correlator (3); Soil Scientist (15); Certified Professional Soil Scientist.

LEE COLLINSWORTH - Retired; SCS Chase County Dist. Conserv. (31); BS-Agric. Econ.; environ. quality.

CLIFTON E. DEAL - SCS Soil Mech. Engr. (1); BS-Geol. Engr.; various courses in soil mech. and dam design, water quality training, Masters thesis research, environ. sem.; Civil Engr. (12), Constr. Engr (3), Proj. Engr. (1), Soil Mech. Engr. (5).

W. DUANE EVANS - SCS Agric. Economist (16); BS-Agric. Econ., MS-Agric. Econ.; statistics, linear programming, computer sci., environ. sem.

FRANK GADDIE - President South Fork Watershed Joint District No. 76 (4), Farmer (50); agric.; Watershed Board Member (15).

H. LYNN GIBSON - SCS State Range Conservationist (7); BS-Range; ecosystems mgt., environ. develop.; Range Conserv. (5), Dist. Conserv. (4); Area Range Conserv. (2).

RICHARD HAGER - SCS State Biologist (6); BS-Bot. (Biol.), MS-Bot. (Ecol.); fisheries, habitat analysis, environ. development, limnology; Area Biol. (5), Conserv. (3), Student Trainee Biol. (2), Conservation Technician (2), Certified Wildlife Biol. T.W.S.

DILLARD HUFFAKER - SCS Area Conservationist (4); BS-Animal Husbandry; RC&D Coordinator (7½), Dist. Conserv. (13½), Soil Conserv. (5), On-Farm Veterans Training Instructor (4½).

GERALD J. LANG - SCS Hydraulic Engr. (4); BS-Agric. Engr.; various courses in soil mech. and dam design, hydrology, and hydraulics; Area Engr. (3); Registered Prof. Engr. Kansas License No. 8479.

KIRK C. MILES - SCS Agric. Economist (5); BS-Agric. Econ.; computer sci., environmental concepts sem.; Soil Conserv. (1/2).

LARRY D. MILES - SCS Water Resources Planning Engineer (12); BS-Civil Engr.; computer technol., engrng. properties of soils, time mgt.; Constr. Engr. (2); Design Engr. (5); Registered Prof. Engr. Kansas License No. 5846.

RICHARD R. RAINES - F&WS Senior Staff Biologist (4); BS-Biol., MS-Biol.; computer programming, Engl. comp., environ. educ.; Park Ranger (2); Environmentalist (2); Fish and Wildlife Biol. (3).

JOHN W. REH - SCS Water Resources Planning Staff Leader (13); BS-Agric. Engr.; computer sci., water resource engrng., wildlife mgt., environ. assessments and statements, multiobjective planning; Hydrol. Engr. (10); Design Engr. (2); Proj. Engr. (2); Registered Prof. Engr. Kansas License No. 5023.

LAWRENCE H. WETTER - SCS Hydraulic Engineer (9); BS-Agric. Engr., MS-Civil Engr (Hydrol.); hydrometeorology, dam break/dam routing, analysis of watersheds and river systems; SCS Area Agric. Engr. (2); Hydraul. Research Asst. (2); County Engr. (roads, bridges) (3); SCS Civil Engr. (proj. constr., dams) (7); Registered Prof. Engr. Kansas License No. 5325

ROSE WHINERY - Kansas Wheat Commission (1); BA-Engl.; linguistics, jour., environ. educ. management sem.; Asst. Instructor (2); Copy Editor (2); Instructor (2), Editor (1); Kansas Secondary Teaching Certificate; SCC Tech. Writer (3).

ROBERT D. WOOD - KFGC Environ. Liaison Biologist (10); BS-Wildlife Mgt.; KFGC Game Biol. (10); Certified Wildlife Biol. T.W.S.

OTHER CONTRIBUTORS:

STAN BULSTERBAUM - SCS RC&D Coordinator (3); BS-Range Management; Environmental Assessment; District Conserv. (8); Range Conserv. (3.5).

ROBERT J. HIGGINS - SCS Biologist (10); BS-Bio.; environ. concepts sem., recreation, environ., water quality testing, warm water fisheries, Conserv. Tech. (1), Range Conserv. (5), Soil Conserv. (7).

PARKER L. KENDRICK - SCS Area Engineer (1); BS-Agric. Engr.; Planning Engineer (3); Constr. Engr. (3); Registered Prof. Engr. Kansas License No. 8337.

LONNIE L. SCHULZE - SCS Resource Conservationist (3); BS-Agric.; Range Conserv. (3); Dist. Conserv. (9); Range Conserv. (3).

The preparers of this document include various consultants in addition to the members of the Interdisciplinary Team and the Triagency Team.

Reservoir topographic maps and bench mark surveys were prepared by Cook, Flatt, and Strobel Engineers, and Bucher and Willis Engineers.

The draft watershed plan and environmental impact statement was reviewed by state Soil Conservation Service staff specialists having responsibility for engineering, soils, agronomy, range conservation, biology, forestry, geology, hydrology, and economics. This review was followed by a review of the document and supporting data by the Midwest National Technical Center.

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31. U.S. Department of the Interior, Fish and Wildlife Service. Wetlands of the United States, Circular No. 39, Washington, D.C., 1976.
32. U.S. Department of the Interior, Fish and Wildlife Service; U.S. Department of Agriculture, Soil Conservation Service; and Kansas Fish and Game Commission. Triagency Wildlife Habitat Evaluation of South Fork Watershed, April 1980.
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43. Kansas State Historical Society. Letter to John W. Tippie, State Conservationist, from Joseph W. Snell, State Historic Preservation Officer, May 1, 1981.

44. Kansas State Historical Society, Phase III Archeological Investigations, January 1984 and June 1984.

45. U.S. Department of Agriculture, Soil Conservation Service. Letter to Joseph Snell, State Historic Preservation Officer, June 27, 1984, with concurrence July 9, 1984.

LIST OF APPENDICES

Appendix A - Letters of Comment

Appendix B - Typical Earth Dam and Basin Map

Appendix C - Supporting Data (Tables I, II, III, IV, and V)

Appendix D - Project Map

A P P E N D I X A

Letters of Comment

Centers for Disease Control
Atlanta GA 30333

April 6, 1984

Mr. John W. Tippie
State Conservationist
Soil Conservation Service
760 S. Broadway
Salina, Kansas 67401

Dear Mr. Tippie:

We have completed our review of the Interagency Review Draft Watershed Work Plan and Environmental Impact Statement (EIS), South Fork Watershed, Butler, Chase, and Greenwood Counties, Kansas. We are responding on behalf of the U.S. Public Health Service.

It is stated that mosquito breeding habitats will be decreased because less flood plain area (2,216 acres) will be flooded. Since the impact upon mosquito populations was considered minor, this factor was not discussed further in the Draft EIS. However, since 11 dams will be installed, we believe that it is essential that vector prevention and control be planned and "built into" these new water impoundment projects. Experience has shown that water impoundment projects invariably create a variety of man-made aquatic habitats favorable for the production of insects of public health importance if the area is not properly prepared prior to impoundage. In view of this, we believe the Final EIS should address pre-impoundage measures for mosquito control and proper maintenance after project completion to preserve the effectiveness of permanent preventive measures. Control measures that would be implemented if a problem occurred should also be addressed.

The recommended alternative indicates that fire control is planned for 162,800 acres of rangeland and forest land. What measures are planned to achieve this objective? A brief summary of planned activities should be provided in the Final EIS.

A breach analysis was made for each dam included in this plan, and a hazard classification of "a" has been assigned to each dam. However, the Draft EIS only indicates that breach hazard information is available from SCS and is not addressed in the draft document. Although class "a" dams have less hazard potential than class "b" and "c" dams, townships could be damaged if a dam failure occurred. The Final EIS should summarize the hazard potential to human health, safety, and welfare, as well as the planned mitigation measures designed to minimize these hazards.

We appreciate the opportunity to review this draft document. Please forward a copy of the Final EIS when it becomes available. If you should have questions regarding our comments, please contact Mr. Ken Holt of our staff at (404) 452-4161 or FTS 236-4161.

Sincerely yours,



Joe H. Miller
Acting Chief, Environmental Affairs Group
Environmental Health Services Division
Center for Environmental Health

Comment 1 - Considering both the area covered by the proposed floodwater-retarding reservoirs and the reduced area of flood plain covered by floodwater, the net effect will be less area for potential breeding of aquatic insects after storms.

More than 600 of these reservoirs have been built to date in Kansas and no insect problems have come to our attention. The draft EIS states on page 40 that the Kansas Department of Health and Environment will assist with any such problems if they do occur.

Comment 2 - The measures are now displayed under the environmental quality plan components on page 26 and as recommended plan elements on page 32.

Comment 3 - Township, as discussed on page 36, refers to township roads. There are no towns or houses that will be flooded by a dam failure. For this reason, all dams in this watershed received an 'A' classification which indicates no hazard potential to human, health, safety, and welfare.

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT

MEMORANDUM

April 13, 1984

To: Rosemary O'Leary, Director
Division of Policy and Planning

From: Jeff Beach, Environmental Planner *JB*

Subject: Review of the Draft Watershed Work Plan and Environmental Impact Statement for the South Fork (Cottonwood River) Watershed - Butler, Chase and Greenwood Counties, Kansas.

As you had requested, Charles and I have reviewed the two environmental impact statements that were routed to Policy and Planning through the Bureau of Water Protection. We split them and each reviewed one. I reviewed the South Fork Watershed Work Plan and EIS (Draft). In giving it the type of review you suggested, I offer the following comments:

- The proposed project is a Public Law 83-566 project. Prepared under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, and amended (16 USC 1001-1008). The document describes a plan for the construction of 11 small dams to be built in the headwaters of the South Fork of the Cottonwood River to solve agricultural flooding and erosion problems. The plan also includes land treatment and woodland habitat management measures to reduce erosion and to enhance terrestrial wildlife habitat.

- There were five alternatives considered in the development of the plan. From the information presented, I am supportive of the alternative that was selected as the "recommended plan." The recommended plan includes both the maximum flood control offered by the National Economic Development (NED) alternative and the improved wildlife habitat elements and increased grazing offered by the Environmental Quality and NED alternatives.

- From an "environmental" point of view, I am generally very supportive of PL-566 type projects. In terms of flood prevention, watershed protection, wildlife habitat enhancement, agricultural land use, etc., I feel projects like this are far more desirable than other types of projects, e.g. large impoundments.

- The proposed project will have an impact on some wildlife species that are on the Kansas List of Endangered and Threatened Species. More specifically the species involved are the Topeka Shiner, Neosho Madtom, and Warty-Backed Mussel. The Topeka Shiner has been collected from 5 of the 11 proposed dam sites. The Neosho Madtom was collected outside the watershed near the confluence of the South Fork with the Cottonwood River. The Warty-Backed Mussel was collected in 1979 according to an Emporia State University report. According to the EIS, the Neosho Madtom is

not affected by the watershed because it's habitat is in gravel bars. Apparently, the preferred habitat of the Topeka Shiner is "relatively clear pools in spring-fed reaches, especially in upland areas near headwaters." The EIS suggests mitigation of the obvious project conflict on the Topeka Shiner by transplanting certain populations of the species to locations with similar habitat in the watershed. This is apparently a joint effort by the Kansas Fish and Game Commission and Emporia State University. The EIS mitigation plan also suggests that if the transplanting is not successful, the project sponsors will consider other options such as: dry dams, construction of substitute sites, or deletion of dam structures 2, 10, 16, 20, and 24 from the plan.

The mitigation measures suggested in the EIS for the Topeka Shiner are good; however, there is nothing mentioned concerning the Warty-Backed Mussel, and I feel the projects impact on the Neosho Madtom could have been explained more fully. The EIS leaves the reader with the assumption that only one Warty-Backed Mussel was found in the project area and that that occurred in 1979. This too could have maybe been explained in more detail.

- I have read the Bureau of Water Protection's comments as written by Walter Wagner, and concur with the sentiments and concerns he expressed.

- In an overall sense, I am supportive of the project. The EIS was well prepared, except for a few cases where items could have been explained in more detail. My recommendation would be that KDHE offer support for the project, with the project sponsors being cognizant of the comments made by KDHE staff.

JB:cms

Comment 1 - In review of the report on the threatened and endangered species in the South Fork Watershed, we noted that even though Cope (1979) reported these species to be in the watershed the Warty-Backed Mussel was not located during intensive aquatic field investigations by Emporia State University. Warty-Backed Mussels are residents of the Cottonwood River and according to the Emporia State University report will not be adversely affected by the project due to the project's effect on decreased sediment load.

Kansas Fish & Game

BOX 54A, RURAL ROUTE 2, PRATT, KANSAS 67124
(316) 672-5911

REGIONAL OFFICES

Northeast Regional Office
Rt. 2, US-3 Bypass
Hays, Kansas 67601

Northeast Regional Office
Box 189, 511 Cedar
Concordia, Kansas 66901
Northeast Regional Office
3300 S.W. 29th Street
Tulsa, Kansas 66614

Southwest Regional Office
808 Highway 56
Dodge City, Kansas 67801

Southwest Regional Office
Box 764, 204 West Sixth
Newton, Kansas 67114
Southwest Regional Office
222 West Main Building
Suite C & D
Chanute, Kansas 66720

March 28, 1984

Mr. John Tippie
State Conservationist
Soil Conservation Service
760 South Broadway
Salina, KS 67401

Dear Mr. Tippie:

We have reviewed the Draft Watershed Work Plan and Environmental Impact Statement for the South Fork Watershed. Most of our earlier comments (letter dated September 23, 1983) have been addressed and/or incorporated into the latter draft.

One exception remains, however. On page 52, reference is made to increased frequency of low flows because of structures built. Obviously, there is a difference of opinion on this matter between our respective staffs. It should appear that this statement may or may not be true depending on individual site characteristics. Therefore, we still recommend deleting this statement or presenting both views. The article by Wetter (1980) is simply an opinion essay and should not be used as a literature citation in the manner it is presented in the Environmental Impact Statement.

Other than the problem mentioned in the preceding paragraph, we have no further comments to make.

Sincerely,

Bill Hanzlick
Bill Hanzlick, Director
Kansas Fish and Game Commission

BH/vl

cc USFWS, Manhattan
KWO, Attn: Larry Hess

Comment 1 - We agree that there is a difference in opinion between our respective staffs on the effects of floodwater retarding dams on the low flows of streams. There is much yet to be learned about this matter but we stand by our position. The presence of conservation treatment and floodwater retarding dams prolongs surface flow in streams after storms and tends to increase groundwater storage and stream base flow. This is most noticeable in humid areas such as eastern Kansas where average annual precipitation exceeds potential evapotranspiration.

Published records of the U.S. Geological Survey show that stream base flows have increased in eastern Kansas in the last 30 years. Although there are other possible causes, this fact is consistent with the 1980 article by Wetter and supports our statement.



United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

Mr. John W. Tippie

ER-84/264

APR 12 1984

The opportunity to comment on this document is appreciated.

Sincerely,

Joseph D. Blanchard
for
Bruce Blanchard, Director
Environmental Project Review

Mr. John W. Tippie
State Conservationist
Soil Conservation Service
Department of Agriculture
760 South Broadway
Salina, Kansas 67401

Dear Mr. Tippie:

The Department of the Interior has reviewed the draft environmental statement and draft watershed plan for the South Fork Watershed Project, Butler, Chase and Greenwood Counties, Kansas, and has the following comments.

General

The proposed plan of watershed development, including construction of floodwater retarding dams, appears to be adequately addressed in the subject document. We should like to point out that the South Fork Cottonwood River, from the confluence with the Cottonwood River to the confluence of the Little Cedar Creek, is included on the final list of rivers in the Nationwide River Inventory (NRI). Although it appears that construction activities associated with the preferred alternative would not have any adverse impacts on the South Fork Cottonwood River, we recommend that further project planning be considerate of the river's listing in the NRI.

Specific

Pages 1 and 4, Summary and Impacts. We believe that this section would be enhanced by including a table that lists the impacts to resources that would be associated with each alternative plan. This would enable a reviewer to quickly compare the environmental ramifications of each plan to the other plans.

Page 5, Areas of Controversy. It is recommended that the statement which indicates that there are no areas of controversy be substantiated by a brief discussion of the results of the public meetings that were held on December 7, 1978, and May 31, 1983.

Page 13, Table A, Cultural Resources. This table indicates that the degree of impact on cultural resources would be minor. However, according to the text, studies regarding significance of sites that could be affected are not yet complete. This discrepancy should be clarified in the table or narrative.

Page 62, Consultation and Coordination. This section would be enhanced if a discussion of the concerns, questions and issues raised at the public meetings were briefly addressed.

Comment 1 - The information displayed in the summary is dictated by the format outlined in SS508.3 of the National Watersheds Manual. A comparison table of the alternative plans can be found on page 29, Table H.

Comment 2 - Areas of controversy are usually not listed until the final plan is published. During the review process every attempt is made to resolve all controversies. If any areas of controversy remain unresolved, they will be listed in this section. There were no areas of controversy brought up at the public meeting.

Comment 3 - The studies have been completed and the table changed accordingly.

Comment 4 - The issues discussed in the public meetings have been included in the narrative on page 62.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
324 EAST ELEVENTH STREET
KANSAS CITY, MISSOURI - 64106

April 16, 1984

John W. Tippie
State Conservationist
U.S. Soil Conservation Service
760 South Broadway
Salina, Kansas 67401

Dear Mr. Tippie:

South Fork Watershed, Rutler,
Chase and Greenwood Counties, Kansas

My staff has completed their review of the draft Environmental Impact Statement (EIS) for the South Fork Watershed, Kansas. We have rated this project and statement LO-2, indicating our lack of objection to proceeding with the project. We were pleased to note the obvious coordination with Kansas Fish and Game Commission in planning for this project, particularly in the mitigation of impacts to the Topeka Shiner.

Although a strong attempt was made to evaluate and address significant issues associated with the project, we have identified specific areas where the draft EIS does not contain sufficient information to fully assess potential impacts of project alternatives:

Water Quality Impacts

The summary contained in Table A, "Resources and Problems Significant to Decisionmaking," on page 13, shows an anticipated minor impact on water quality by project alternatives. We believe this indicates that secondary impacts of the selected alternative were not fully addressed.

Discussion of the recommended plan (last paragraph, page 32) indicates that brush control practices, including pesticide spraying, will be used on 2,000 acres in the project area. The potential water quality impact of this pesticide use in brush control should be discussed.

Discussion of the effects of the recommended alternative (#5) on page 28 indicates that the proposed action will provide the same flood protection benefits as the National Economic Development (NED) alternative. Previous discussion of the NED alternative (#2), on page 25, last paragraph, shows a benefit resulting from more intensive farming in the protected floodplain. Although this "more intensive farming" is not fully characterized, the draft EIS indicates it would possibly involve expanded use of fertilizers (page 9) and shifts in the types of crops

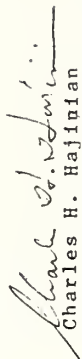
grown (page 52). We believe this may create a potential for water quality impacts since this would occur on land immediately adjacent to streams in the project area. The nature of this intensification of farming and its potential for impact on water quality should be fully discussed in the final EIS.

Aquatic Fauna Impacts

The draft EIS notes that the proposed project will have major impact on streamflows in the area (Table A, page 13 and page 52), and states, "Aquatic fauna are composed of species whose life history is dependent on fluctuating water conditions. . . ." (pages 10-11). Discussion on page 56 of the draft EIS implies that adverse impacts on the Topeka shiner are expected to result from dam construction, however, the potential for effects on other species with similar habitat requirements is not fully addressed.

We appreciate the opportunity to review and comment on this draft statement. If you have questions about our comments or wish to discuss the project, please contact Lynn Kring of my staff. He can be reached at FTS 758-5593.

Sincerely yours,


Charles H. Hajinian
Chief, Environmental
Review Branch

Comment 1 - Planning studies considered secondary impacts as well as direct effects. Secondary impacts on water quality were also considered minor.

Comment 2 - The sentence has been changed to read that herbicide application will be applied according to label directions. Also, on page 57 a sentence has been added stating degradation of water quality due to herbicide use is not anticipated.

Comment 3 - There will be an increased use of fertilizers in the areas expected to be farmed more intensively. However, the increase is expected to be relatively small in comparison to current usage on the flood plain. The decrease in flood frequency is expected to more than offset the effects on water quality.

Comment 4 - The potential decrease in habitat for species which require intermittent conditions was taken into account during the Tri-agency Aquatic Assessment. The major impact on stream flows noted in Table A is primarily from reductions of high flood flows. Such impacts are not expected to adversely impact aquatic fauna. Impacts on the Topeka shiner are related to their unique habitat needs. Similar impacts on other aquatic fauna are not expected.

A-5



DEPARTMENT OF THE ARMY
SOUTHWESTERN DIVISION, CORPS OF ENGINEERS
1114 COMMERCE STREET
DALLAS, TEXAS 75242
March 13, 1984

REPLY TO
ATTENTION OF

Planning Division

John W. Tippie
State Conservationist
Soil Conservation Service
760 S. Broadway
Salina, Kansas 67401

Dear Mr. Tippie:


We appreciate the opportunity to review your Interagency Review Draft, Watershed Work Plan and Environmental Impact Statement for South Fork Watershed - Butler, Chase, and Greenwood Counties, Kansas.

- 1 | The report identifies 280 acres of Type 5 wetland, but does not discuss the impacts the proposed alternatives and/or recommended plan would have on the wetlands. Additionally, we suggest the report include discussion on the amounts and method of disposal of excavation material associated with each structural alternative and the recommended plan.
- 2 |

Comment 1 - On page 57 we have added a statement explaining there is no effect anticipated on any existing wetlands due to project actions

Comment 2 - It is expected that all excavated material will be placed in the dams.

Sincerely,


HARRY S. ROUGHT, P.E.
Chief, Planning Division



DEPARTMENT OF THE ARMY
KANSAS CITY DISTRICT, CORPS OF ENGINEERS
700 FEDERAL BUILDING
KANSAS CITY, MISSOURI 64106

REPLY TO
ATTENTION OF

April 3, 1984

Permit Evaluation and
Enforcement Section
(BU, CS, GW - KS - NWP)

Mr. John W. Tippie
State Conservationist
Soil Conservation, Service
760 South Broadway
Salina, Kansas 67401

Dear Mr. Tippie:

This office has been forwarded a copy of the inter-agency review draft of the South Fork Watershed Work Plan and Environmental Impact Statement by the Corps of Engineers' Tulsa District for review of Department of the Army (DA) permit requirements.

Our review of the information contained in the review draft confirms that the proposed activities will not involve the discharge of dredged or fill material into any streams that have a median flow greater than 5 cubic feet per second, as stated in the review draft. Under Federal regulations 33 CFR 320-330, published in the July 22, 1982 Federal Register, discharges of dredged or fill material into a stream where the flow is less than 5 cubic feet per second are permitted by nationwide permit and therefore, an individual DA permit is not required for the proposed activities.

However, in accordance with the enclosed copy of Excerpts from 33 CFR Part 330, you are required to follow the management practices to the maximum extent practicable and to insure that the special conditions listed are satisfied prior to any discharge of dredged or fill material into any stream at the site of your proposed activities. Particular attention is directed to management practice number (3), which stipulates that the discharge should not restrict or impede the passage of normal or expected high flows.

-2-

Although an individual DA permit will not be required for the proposed project, this does not preclude the possibility that state and/or local permits may be required and you should satisfy yourself in this regard.

If you have any questions concerning this matter, please feel free to write me or to call Mr. Bill DeMar at 816-374-5643.

Sincerely,

M. D. Jewett
Chief, Regulatory Functions Branch
Operations Division

Enclosure

Copies Furnished:

Kansas Fish & Game Commission
no enclosure

Comment 1 - We will follow the 330.6A management practices to the maximum extent practical.



DEPARTMENT OF THE ARMY
TULSA DISTRICT, CORPS OF ENGINEERS
POST OFFICE BOX 61
TULSA, OKLAHOMA 74121

REFERS TO
ATTENTION OF

March 26, 1984

Planning
Environmental Resources

Mr. John W. Tippie
State Conservationist
Soil Conservation Service
760 South Broadway
Salina, KS 67401

Dear Mr. Tippie:


We have reviewed the interagency review draft of the South Fork Watershed Work Plan and Environmental Impact Statement that was enclosed with your letter dated February 17, 1984.

We reviewed with particular interest the effect this project and other similar projects would have on the operation of Marion Lake. From Table 3, the combined releases from the 11 lakes would be about 1,000 cubic feet per second (c.f.s.) extending over a period from 5 to 10 days. The operational channel capacity on the Cottonwood River in this vicinity is about 8,000 c.f.s. Thus, releases from the South Fork Watershed would be using about 1/8 of the operational channel capacity and could cause delays in flood control releases from Marion Lake. With several possible watersheds to be developed within the Cottonwood River Basin the effect on the flood control operation of Marion would be significant. We therefore recommend a basin-wide analysis of all existing and proposed flood control projects be made and a coordinated operating plan be developed before finalizing the sizing of the flood control conduits. We suggest that a meeting be scheduled in the near future to develop a plan for sharing the channel capacity of the Cottonwood River between Marion Lake and the proposed projects.

Regulatory responsibilities of the Clean Water Act for this project lie within the jurisdictional boundary of the Kansas City District Corps of Engineers. A copy of this report is being transmitted to that office for their review.

Thank you for providing the opportunity to review this report.

Sincerely,


Robert D. Brown, P.E.
Chief, Planning Division

Copy furnished:
Kansas City District
Kansas City, Missouri

Comment 1 - The Cottonwood Basin has been mathematically modeled, both with and without all existing and potential SCS and Corps projects. A number of historical and synthetic storms were studied with channel capacities and reservoir releases as important considerations. Through meetings and correspondence SCS and Corps hydrologists have satisfied these mutual concerns.

STATE OF KANSAS



OFFICE OF THE GOVERNOR

State Capitol
Topeka 66612-1590

April 19, 1984

John Carlin Governor

Mr. John W. Tipple
State Conservationist
Soil Conservation Service
P. O. Box 600
Salina, Kansas 67401

Dear Mr. Tipple:

In reply to your request of February 16, 1984, I submit the following comments on the Watershed Work Plan and Environmental Impact Statement for South Fork Watershed. Comments are on behalf of the State of Kansas and are based on a review by the Kansas Water Office with cooperation from interested state agencies. The purpose of the review was to develop a state position on the proposed project.

The Kansas Water Office advises that flooding and erosion constitutes a serious economic problem in the watershed study area, and that the recommended plan of improvement is the most desirable of all solutions studied. South Fork Watershed Joint District No. 76, Chase County Conservation District, as local sponsors, have expressed their willingness to assume local responsibilities associated with the project. Comments received by the Kansas Water Office during the review of this plan noted the need for minor additions, which have been transmitted directly to you. General comments were supportive of the project.

It should be noted that under provisions of Kansas Law, approval of the specific projects in the plan are required by the Chief Engineer, Division of Water Resources, Kansas State Board of Agriculture, and are required prior to initiation of specific project construction. The plan, as set forth in your report, conforms to general provisions of the State Water Plan and is also in accordance with general state water policies.

In view of the foregoing, I support the recommended plan and urge that the proposed plan be implemented at the earliest possible date.

Sincerely,

A large, stylized handwritten signature of John Carlin, written in dark ink.

JOHN CARLIN
Governor

No response necessary



United States
Department of
Agriculture

Forest
Service

Rocky Mountain
Region

11177 W. 8th Ave.
P. O. Box 25127
Lakewood, CO 80225

Reply to: 3510

Date: 22 February 1984

Mr. John W. Tippie
Kansas State Conservationist
State Office, P. O. Box 600
760 South Broadway
Salina, KS 67401

Dear Mr. Tippie:

We have reviewed the interagency draft for the South Fork Watershed Work Plan in Butler, Chase, and Greenwood Counties.

No response necessary

The forestry and fire control aspects are adequately covered. The project looks like a good one.

Sincerely,


THOMAS E. SCHESSLER

Director, Watershed, Soils, and
Minerals Area Management





U.S. Department of Housing and Urban Development
Kansas City Regional Office, Region VII
Professional Building
1103 Grand Avenue
Kansas City, Missouri 64106

Mr. John W. Tippie
State Conservationist
U. S. Department of Agriculture
760 South Broadway
Salina, KS 67401

Dear Mr. Tippie:

SUBJECT: Draft Environmental Impact Statement: South Fork Watershed -
Butler, Chase, and Greenwood, Kansas (January 1984)

This office has reviewed the subject Draft Environmental Impact Statement for the South Fork Watershed in central Kansas. The document was found to be satisfactory in meeting the spirit and intent of the National Environmental Policy Act (NEPA) of 1969 and no apparent adverse impacts have been noted relating to Department of Housing and Urban Development projects in this jurisdiction.

No response necessary

We appreciate the opportunity to comment on this matter.

Sincerely,

Lance L. Long
Environmental Officer
Office of Community Planning
and Development



United States
Department of
Agriculture

Office of
the Secretary

Office of
Equal
Opportunity

Washington, D.C.
20250

8 MAR 1984

SUBJECT: South Fork Watershed Plan/Environmental
Impact Statement in Kansas

TO: John W. Tippie
State Conservationist

THRU: Peter C. Myers, Chief
Soil Conservation Service

We have reviewed the Soil Conservation Service Draft Watershed Plan/Environmental Impact Statement (EIS) for the South Fork Watershed in Butler, Chase, and Greenwood Counties, Kansas. The purpose of our review was to assess the impact, if any, your proposed project will have on minorities residing in or near the watershed.

Your draft plan indicates on Page 7 under the section entitled, Project Setting, that there are no minorities in the watershed. Therefore, it appears that the proposed plan will have no significant civil rights impact.

Thank you for this opportunity to review and comment on your draft Plan/EIS.

Alma R. Esparza
ALMA R. ESPARZA
Director

Prepared by: Shirlene Mattison, Program Analyst
Name/Title: CRD - PPEB
Division: 447-3720 Date: 3/7/84
Extension:

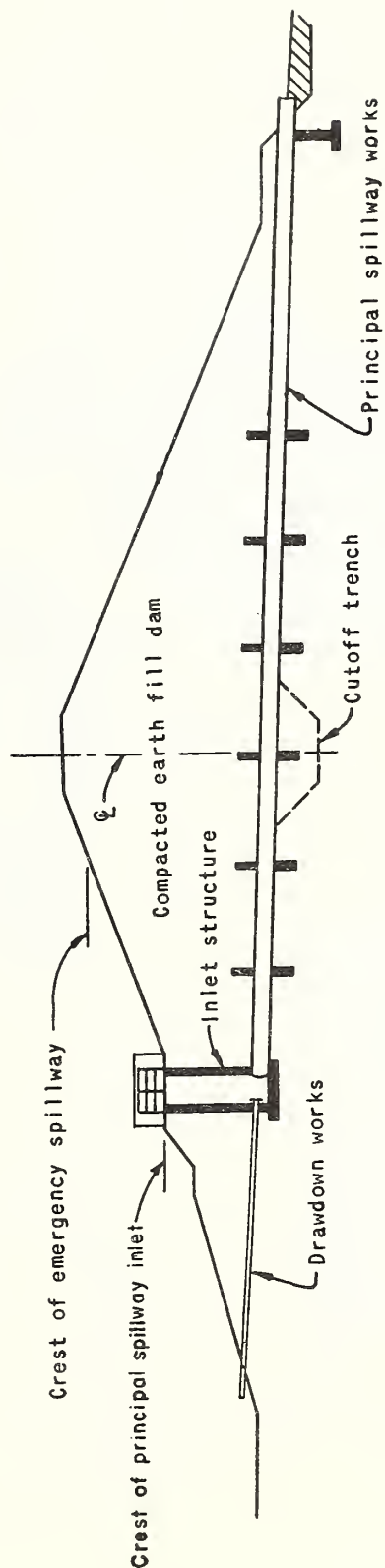
No response necessary

A P P E N D I X B

Typical Earth Dam With Drop Inlet Spillway

Cottonwood River Basin Map

TYPICAL EARTH DAM WITH DROP INLET SPILLWAY



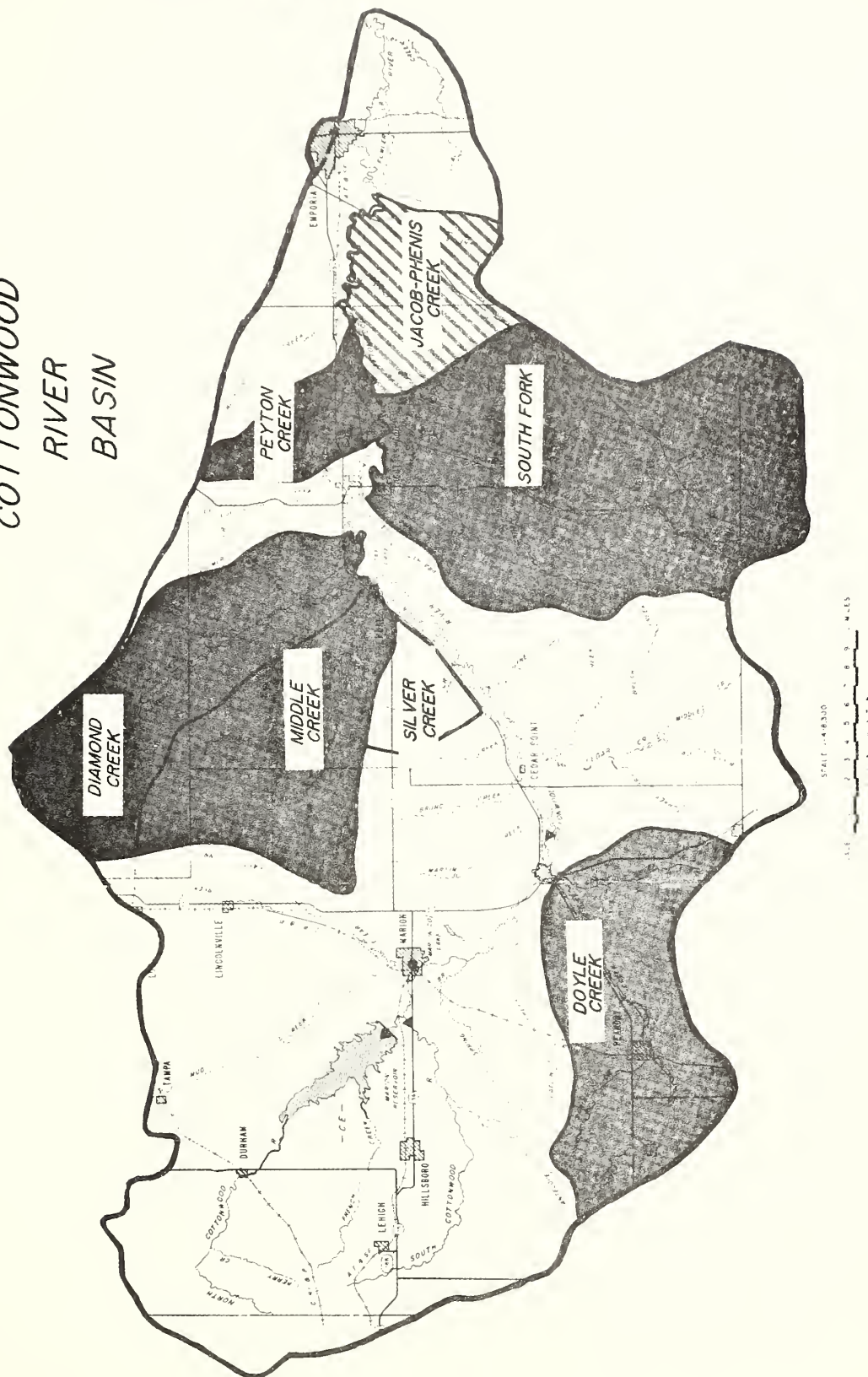
B-1

CROSS SECTION OF DAM ON CENTERLINE OF PRINCIPAL SPILLWAY

NOTES:

1. FOR INDIVIDUAL STRUCTURE DATA SEE TABLE 3.
2. EMBANKMENT AND FOUNDATION DESIGN FEATURES NOT SHOWN.

COTTONWOOD RIVER BASIN



A P P E N D I X C

Supporting Data

Tables I, II, III, IV, and V

TABLE I
HABITAT UNITS BY LAND COVER
South Fork Watershed, Kansas

Land Cover	<u>Present Condition</u>		<u>Future w/o Project</u>		<u>Recommended Plan</u>	
	Rated Value	Habitat Units	Rated Value	Habitat Units	Rated Value	Habitat Units
HERBACEOUS:						
Cropland	2.5	41,933	3.0	50,319	3.0	50,013
Grassland						
Rangeland	4.8	750,317	5.4	843,026	5.4	842,168
Pastureland	4.0	11,118	4.3	12,027	4.3	12,027
Compensation					10	750
Habitat Improvement ^{a/}						135,915 ^{b/}
Total Herbaceous		803,368		905,372		1,040,873
WOODY:						
Forestland	6.0	29,454	6.2	30,436	6.2	29,782
Compensation						654
Habitat Improvement ^{a/}						750 ^{c/}
Total Woody		29,454		30,436		31,186
AQUATIC:						
Stream						
Intermittent	6.3	4,385	6.3	4,385	6.3	4,275
Perennial	6.8	2,570	6.8	2,570	6.8	2,564
Total Stream		6,955		6,955		6,839
Flatwater						
Pond, Lake	6.4	4,979	6.4	6,259	6.4	8,064
Habitat Improvement ^{a/}					6.4	384 ^{d/}
Total Flatwater		4,979		6,259		8,448

- ^{a/} Habitat units from accelerated land treatment technical assistance
- ^{b/} Includes: Rangeland improvement, (1) 10,935 acres from poor to good = 54,675 HU, (2) 20,310 acres from fair to good = 81,240 HU; Wildlife land, 12 acres improved from 7.5 to 10 = 30 HU around six stockwater ponds; loss of 60 acres rangeland to water at 7.5 = - 450 HU
- ^{c/} 250 acres of forestland managed for wildlife with rating improved from 6 to 9
- ^{d/} 60 acres in stockwater ponds

December 1982

Table II

Wildlife Habitat Compensation Alternatives
For South Fork Watershed
Chase, Butler, and Greenwood Counties
December 1982

Site Number	Habitat Units Lost		Habitat Units to be Compensated		Alternate 1 Acres to be Revegetated		Alternate 2 Est. Acres to be Preserved		Net Change (Habitat Units)
	Woodland	Herbaceous	Woodland	Herbaceous	Woodland	Herbaceous	Riparian Based upon Woodland 10-R value of		
2	0	99.6	0	50	0	5	0	3.0	-49.6H
3	34.2	88.0	34.2	30	4.6	3	11.4	3.0	-58.0H
6	34.8	110.7	34.8	50	4.6	5	11.6	3.0	-60.7H
7	43.2	167.6	43.2	80	5.8	8	14.4	3.0	-87.6H
9	62.0	105.0	62.0	30	8.3	3	20.7	3.0	-75.0H
10	32.3	190.3	32.3	130	4.3	13	10.8	3.0	-60.3H
16	0	151.0	0	30	0	3	0	3.0	-121.0H
20	62.6	103.5	62.6	70	8.3	7	20.9	3.0	-33.5H
22	128.0	117.0	128.0	70	17.1	7	42.7	3.0	-47.0H
24	162.6	60.0	162.6	100	21.7	10	54.2	3.0	+40.0H
23A	94.0	155.0	94.0	110	12.5	11	31.3	3.0	-45.0H
TOTAL	653.7	1,347.7	653.7	750	87.2	75	218.0		-597.7H

Habitat units equal the rated quality value (variable 1 to 10) multiplied by acres. Compensation may be accomplished by Alternate 1 which is new plantings, by Alternate 2 which is retention and improvement of existing woodland, or by a combination of the alternatives.

TABLE III
FLOOD DAMAGES BY REACH^{a/}
South Fork Watershed, Kansas

Reach	Crop and Pasture \$	Other Agriculture \$	Road and Bridge \$	Scour \$	Total \$
1	12,200	4,700	2,600	5,800	25,300
2	10,000	3,800	--	4,700	18,500
3	11,700	6,800	2,000	2,800	23,300
5	86,800	14,100	1,000	40,800	142,700
7	35,500	1,100	2,200	10,600	49,400
8	34,100	2,800	100	4,000	41,000
9	19,900	1,600	--	1,200	22,700
10	26,100	4,700	--	6,300	37,100
11	34,000	2,700	--	11,700	48,400
12	45,700	3,500	--	7,900	57,100
13	57,000	7,100	100	5,400	69,600
14	16,500	3,100	500	900	21,000
16	18,600	2,800	--	1,500	22,900
17	27,600	2,600	500	3,100	33,800
18	17,200	1,400	--	1,000	19,600
19	22,700	6,200	--	800	29,700
20	16,300	1,300	--	1,000	18,600
TOTAL	491,900	70,300	9,000	109,500	680,700

^{a/} WRC projected 1982 current normalized prices for crop and pasture and scour; all other 1982 price base

November 1983

TABLE IV - ANNUALIZED ADVERSE NED EFFECTS

South Fork Watershed, Kansas

(Dollars)^{a/}

EVALUATION UNIT	PROJECT OUTLAYS		TOTAL
	Amortization of Installation Cost	Operation and Maintenance Cost	
Floodwater Retarding Dams Nos. 6, 7, 9, 10, 16, 20, 22, 23A, and 24	392,500	14,900	407,400
Floodwater Retarding Dam No. 2	32,700	1,400	34,100
Floodwater Retarding Dam No. 3	19,500	800	20,300
Accelerated Land Treatment	54,500	38,900	93,400
TOTAL	499,200	56,000	555,200

^{a/} Price Base 1982, discounted and annualized at 7 7/8 interest rate for 100 years.

January 1984

TABLE V - COMPARISON OF NED BENEFITS AND COSTS

South Fork Watershed, Kansas

Dollars)^{a/}

Evaluation Unit	Damage Reduction Benefits	Intensification Benefits	Flood Damage Reduction Benefits Outside Watershed	Total Benefits	Total Costs ^{b/}	Benefit Cost Ratio
Floodwater Retarding Dams Nos. 6, 7, 9, 10, 16, 20, 22, 23A, and 24	339,200	43,500	134,300	517,000	407,400	1.3:1
Floodwater Retarding Dam No. 2	25,200	6,100	8,700	40,000	34,100	1.2:1
Floodwater Retarding Dam No. 3	15,300	2,500	4,000	21,800	20,300	1.1:1
Accelerated Land Treatment	0	203,700	0	203,700	93,400	2.2:1
TOTAL	379,700	255,800	147,000	782,500	555,200	1.4:1

^{a/} Price Base 1982; annual benefits for 100 years.^{b/} From Table IV

January 1984

A P P E N D I X D

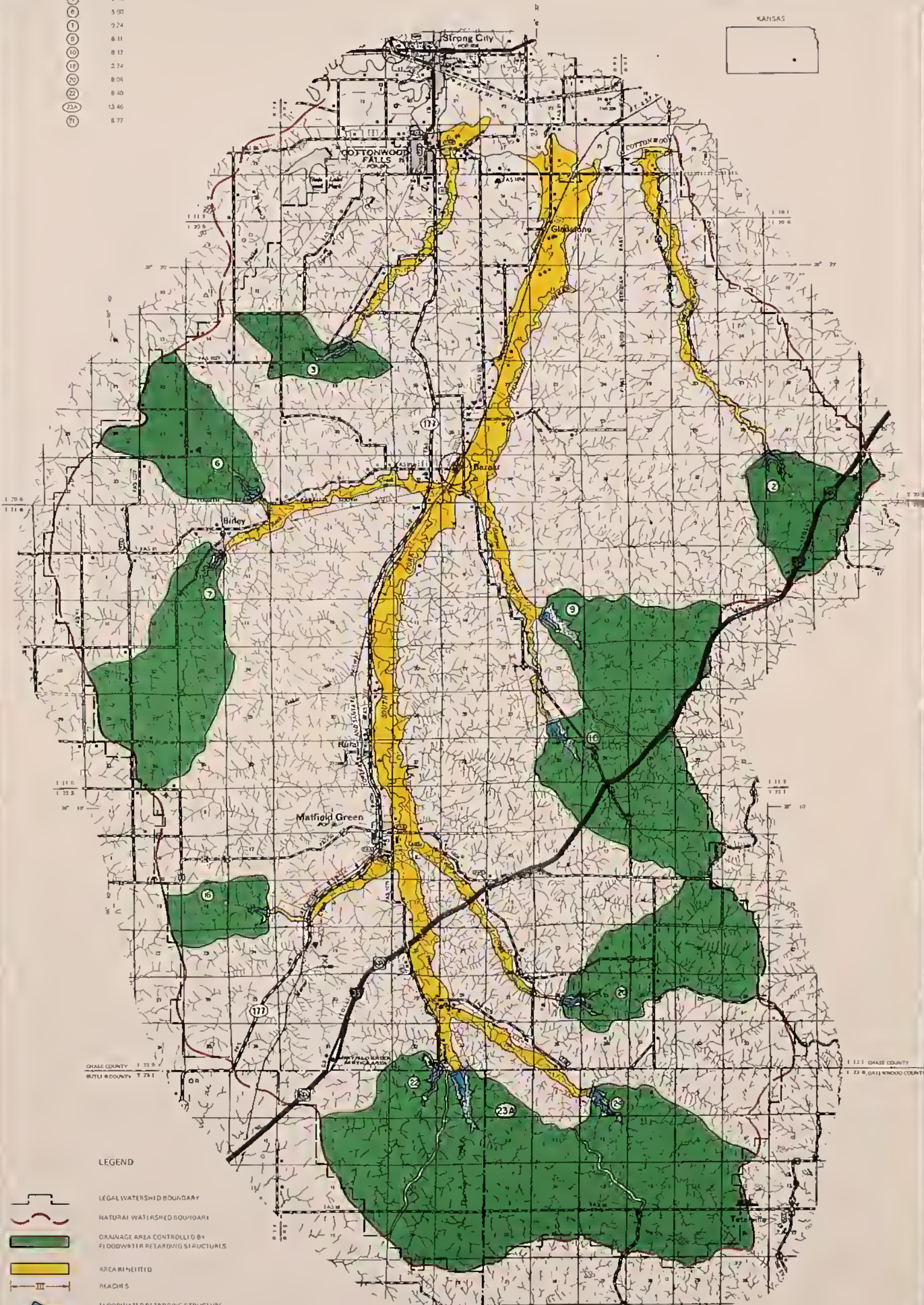
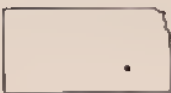
Project Map

DRAINAGE AREA IN SQUARE MILES

2	4.54
3	7.01
6	5.93
1	7.74
9	8.11
10	8.17
16	2.74
20	8.04
22	8.40
23A	13.46
21	8.77

SCALE 0 1 2 3 4 5 6 7 8 9 10 MILES

KANSAS



LEGEND

- LEGAL WATERSHED BOUNDARY
- NATURAL WATERSHED BOUNDARY
- DRAINAGE AREA CONTROLLED BY FLOODWATER RETARDING STRUCTURES
- AREA BENEFITED
- ROADS
- FLOODWATER RETARDING STRUCTURE
- SEDIMENT STORAGE POOL
- FLOODWATER RETARDING STORAGE POOL

PROJECT MAP
SOUTH FORK WATERSHED
CHASE, BUTLER AND GREENWOOD COUNTIES

FROM INFORMATION FURNISHED
BY U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

REV. NOVEMBER 1983

PREPARED BY: RUGER AND WILSON
CONSULTING ENGINEERS, PLANNERS
AND ARCHITECTS, FIDRA STATE HOUSE
BAY COMMUNITY MAPS OF CHASE,
BUTLER AND GREENWOOD COUNTIES



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